ENGINEERING NEWS-RECORD

FEBRUARY 7, 1946

Annual Survey and Forecast

How Engineers Solved

"THE CASE OF THE WEAK-KNEED ROAD"

It doesn't look like it now, but just a few years ago this state highway in Lead, S. Dakota, developed "weak knees." Lack of stability of the fill material caused excessive pressure, and a portion of the old rubble masonry wall, though rebuilt once, failed to hold. Valuable railroad property below was endangered, as well as highway traffic.

Maintenance engineers then prescribed a permanent "cure"— an ARMCO Bin-Type Retaining Wall that stabilized the slope for keeps. Now the highway has firm support and adjacent property is safe from encroachment.

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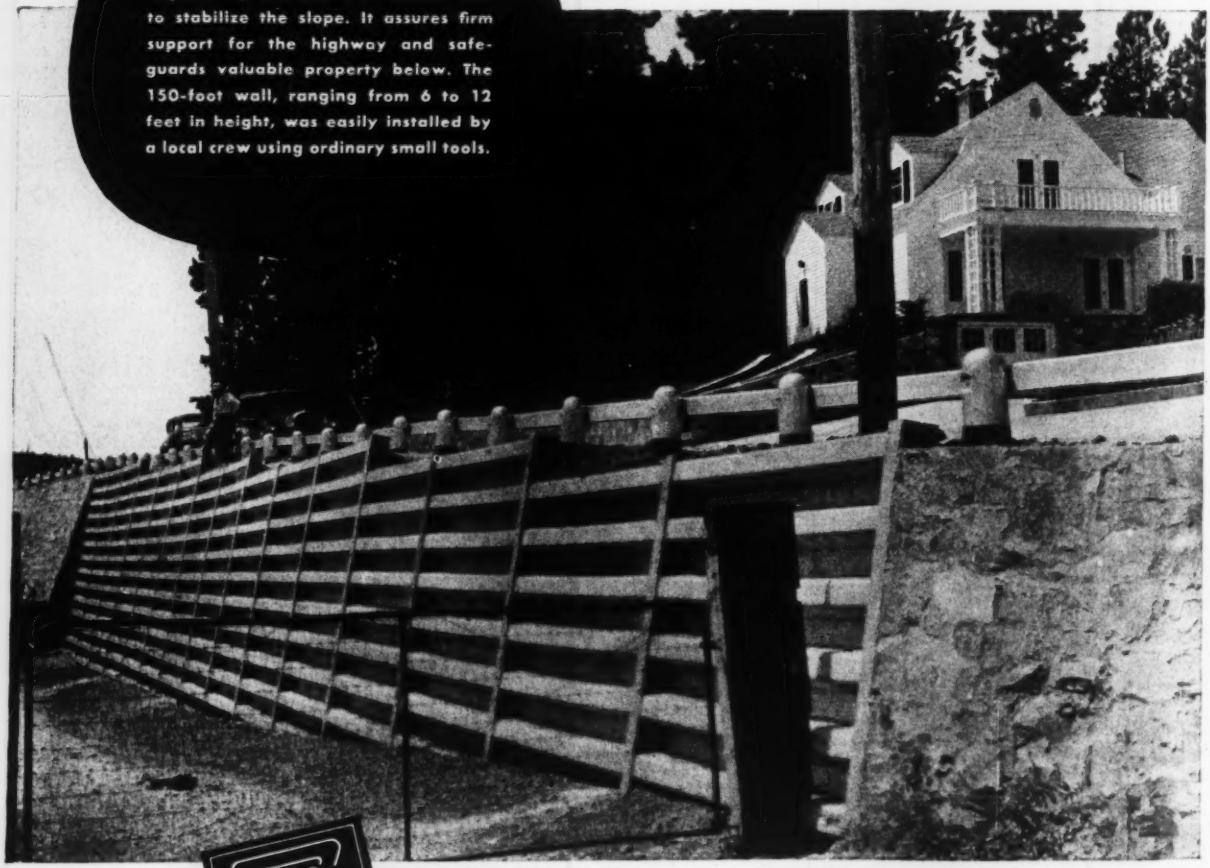
Get complete facts on these improved cellular walls for your earth-retention problems. Armco Drainage & Metal Products, Inc., and Associated Companies, 875 Curtis Street, Middletown, Ohio.



Engineers prescribed this ARMCO Wall to stabilize the slope. It assures firm support for the highway and safeguards valuable property below. The 150-foot wall, ranging from 6 to 12 feet in height, was easily installed by a local crew using ordinary small tools.

ARMCO BIN-TYPE RETAINING WALLS

ENGINEERING NEWS-RECORD

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New Construction in January

Total volume for month is $348,277,000. Private and State and Municipal construction record strong gains over January 1945 as Federal work declines.

Civil engineering construction volume in continental United States totals $348,277,000 for January, an average of $69,655,000 for each of the five weeks of the month. This average volume is 17 percent above the average for the four weeks of December, and is 216 percent greater than the average of the four weeks of January 1945.

Private construction for January on a weekly average basis is 10 percent greater than last month and 487 percent greater than January 1945. Public construction is 35 percent above last month and 58 percent over the month last year. State and municipal construction average for January is 26 percent greater than the preceding month and 284 percent greater than the month last year. Federal construction topped last month by 55 percent but recorded a 22 percent drop below the corresponding month of 1945.

The January 1946 weekly averages in the various classes of construction compared with last month show gains in earthwork and drainage, 733 percent; highways, 38 percent; commercial buildings, 26 percent; public buildings, 25 percent; unclassified, 17 percent. Losses were reported for waterworks, down 40 percent; bridges, 38 percent; sewerage, 27 percent; and industrial buildings, 4 percent.

Comparison of January 1946 and January 1945, on a weekly average basis reveal strong gains in all but three of the classifications as follows: gains; commercial buildings, 3,520 percent; earthwork and drainage, 1,768 percent; highways, 253 percent; industrial buildings, 243 percent; bridges, 123 percent; and waterworks, 23 percent; losses; public buildings, 24 percent; unclassified, 17 percent; and sewerage, 12 percent.

Geographically, four of the six sections recorded higher weekly averages in January 1946 than in December, 1945, as follows: New England, up 124 percent; Middle Atlantic, up 34 percent; Southern, up 48 percent; Middle West, down 35 percent; West of the Mississippi, down 27 percent; and Far West, up 68 percent.

All sections recorded strong gains in January 1946, compared with January 1945, as follows: New England, 925 percent; Middle Atlantic, 416 percent; Southern, 133 percent; Middle West, 189 percent; West of the Mississippi, 111 percent; and Far West 212 percent.

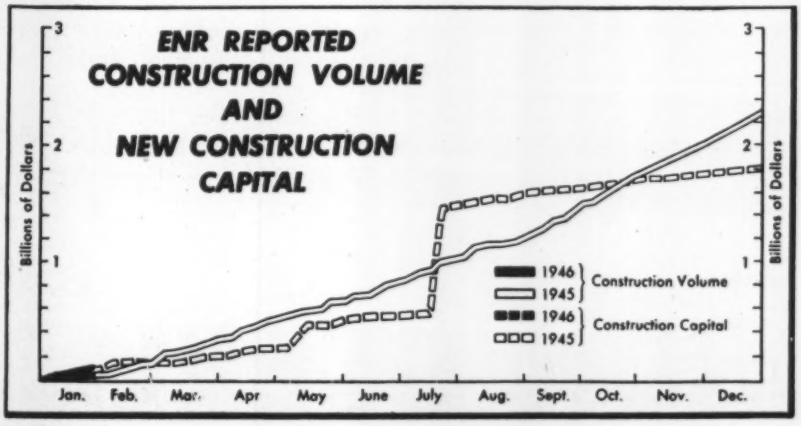
New capital for construction purposes for the five weeks of January, 1946 totals $103,797,000, an increase of 46 percent over the preceding month, and 298 percent greater than the total for the month of January, 1945. The current month's financing for construction purposes is made up of $51,558,000 in corporate securities and $52,238,000 in state and municipal bond sales.

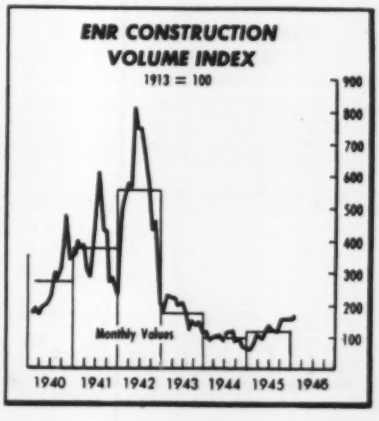
ENGINEERING CONSTRUCTION CONTRACTS REPORTED TO ENGINEERING NEWS-RECORD—JANUARY, 1946

Engineering News-Record *reports continental U. S. Construction projects of the following minimum costs — waterworks, excavation, drainage and irrigation,* $15,000; *other public works,* $25,000; *industrial buildings,* $40,000; *other buildings,* $150,000

Five Weeks — Thousands of Dollars (000 Omitted)

	New England	Middle Atlantic	South	Mid West	West of Mississippi	Far West	United States January 1946	United States January 1945	Canada
Public Works									
Waterworks	212	991	674	1,220	265	1,936	5,298	3,458	171
Sewerage	.....	216	165	665	444	963	2,453	2,238	39
Bridges, public	.....	770	2,571	598	1,983	3,212	9,134	1,146	.....
Earthwork and waterways	287	128	1,307	34	1,461	24,622	27,839	1,192	18
Streets and roads	697	2,617	5,323	847	9,140	17,332	35,956	8,147	1,155
Buildings, public	1,016	3,131	2,143	6,172	5,977	4,078	22,517	23,647	1,516
Unclassified, public	18	611	556	492	3,452	2,488	7,617	16,003	3,685
Total public	**2,230**	**8,464**	**12,739**	**10,028**	**22,722**	**54,631**	**110,814**	**55,831**	**6,584**
Federal government (included in above classifications)	199	1,916	1,835	404	7,269	28,550	40,173	41,121	.....
Private									
Bridges, private	.....	25	.....	1,000	.....	.....	1,025	2,500	.....
Industrial buildings	3,360	23,430	23,813	15,167	16,665	24,359	106,794	24,223	13,718
Commercial buildings	31,500	31,447	3,396	8,376	19,110	24,373	118,202	2,613	3,808
Unclassified, private	.....	542	2,515	2,172	3,423	2,790	11,442	2,326	153
Total private	**34,860**	**55,444**	**29,724**	**26,715**	**39,198**	**51,522**	**237,463**	**32,362**	**17,679**
Total Engineering Construction:									
January, 1946 — 5 weeks	**37,090**	**63,908**	**42,463**	**36,743**	**61,920**	**106,153**	**348,277**	.....	**24,263**
January, 1945 — 4 weeks	2,898	9,906	14,588	10,175	23,433	27,193	.....	88,193	5,087
December, 1945 — 4 weeks	13,240	38,210	22,885	44,968	68,305	50,401	238,009	.....	12,933





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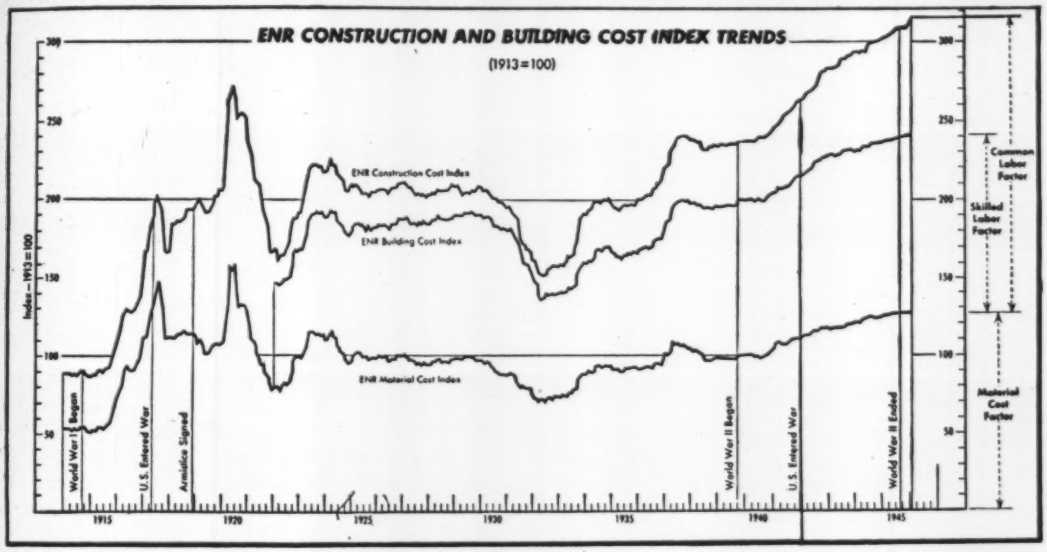
FEBRUARY CONSTRUCTION BUSINESS REPORT



ENR CONSTRUCTION VOLUME AND NEW PRODUCTIVE CAPITAL

(,000 omitted)	January 1945	January 1946	% Change
Total U. S. Construction	$88,193	$348,277	+295
Private Construction	32,362	237,463	+634
Public Construction	55,831	110,814	+98
Federal	41,121	40,173	−2.3
Total New Productive Capital	103,217	262,117	+154
Private Investment	26,080	103,797	+298
Federal (non-federal work)	.....	.....	.....
Federal (federal work)	77,137	158,320	+105
E N R Construction Volume Index 1913=100	63	189	+200

ENR INDEX NUMBERS

Base = 100	Construction Cost 1913	Construction Cost 1926	Building Cost 1913	Building Cost 1926	Volume '13	Volume '26
Feb., 1946	319.52	153.59	243.94	131.86	...	...
Jan., 1946	316.32	152.05	242.23	130.94	189	83
Dec., 1945	313.48	150.69	240.82	130.18	163	71
Nov., 1945	309.28	148.67	240.55	130.00	173	76
Oct., 1945	309.28	148.67	240.35	129.93	167	73
Sept., 1945	309.28	148.67	240.07	129.77	164	72
Aug., 1945	309.08	148.57	239.94	129.70	119	52
July, 1945	308.99	148.53	239.64	129.54	119	52
June, 1945	308.99	148.53	239.37	129.40	133	58
May, 1945	307.43	147.78	238.46	128.90	93	41
April, 1945	306.43	147.30	238.46	128.90	99	43
Mar., 1945	304.50	146.37	237.85	128.57	103	45
Feb., 1945	303.70	145.99	237.71	128.50	78	34
Jan., 1945	302.50	145.41	236.51	127.85	63	28
1945 (Av.)	307.74	147.93	239.14	129.27	123	54
1944 (Av.)	298.63	143.59	234.73	126.89	96	42
1943 (Av.)	289.95	139.38	228.75	123.66	176	77
1942 (Av.)	276.31	132.82	222.39	120.22	553	243

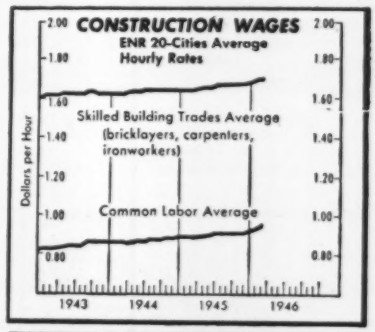
CONSTRUCTION COSTS . . . . WAGE RATES . . . . MATERIAL PRICES

	February 1945	February 1946	% Change	1945 Jan.	1945 Feb.	% Change	1946 Jan.	1946 Feb.	% Change
E N R Construction Cost Index, 1913=100‡	303.70	319.52	5.2	302.50	303.70	.4	316.32	319.52	1.0
E N R Building Cost Index, 1913=100‡	237.71	243.94	2.6	236.51	237.71	.5	242.23	243.94	.7

‡ *Does not reflect increased costs due to overtime, lower labor efficiency, delivery delays, etc.*

ENR 20-CITIES AVERAGE

Common labor	$0.891	$0.968	+8.6	$0.891	$0.891	0.0	$0.953	$0.968	+1.6
Skilled Labor (av. 3 trades)	1.641	1.726	+5.1	1.641	1.641	0.0	1.701	1.726	+1.5
Bricklayers	1.739	1.823	+4.8	1.739	1.739	0.0	1.787	1.823	+2.0
Structural Iron Workers	1.698	1.764	+3.8	1.698	1.698	0.0	1.748	1.764	+1.0
Carpenters	1.487	1.592	+7.0	1.487	1.487	0.0	1.567	1.592	+1.6
Cement, per barrel	2.72	2.73	+0.4	2.69	2.72	+1.1	2.74	2.73	−0.3
Reinforcing steel, cwt.	2.79	2.79	0.0	2.79	2.79	0.0	2.79	2.79	0.0
Structural steel base	2.10	2.10	0.0	2.10	2.10	0.0	2.10	2.10	0.0
Sand, per ton	1.25	1.25	0.0	1.25	1.25	0.0	1.25	1.25	0.0
Lumber, 2x4, Fir, per M ft.	55.32	34.99	−0.6	55.32	55.32	0.0	54.99	54.99	0.0
Lumber, 2x4, Pine, per M ft.	53.44	54.55	+2.0	53.44	53.44	0.0	54.55	54.55	0.0
Common brick, per M	18.32	20.00	+9.0	18.41	18.32	−0.5	19.91	20.00	+0.4
Ready-mixed concrete, c.y.	7.48	7.73	+3.3	7.47	7.48	+0.1	7.64	7.73	+1.2
Struct. clay tile, 3x12x12	83.00	88.49	+6.6	83.00	83.00	0.0	89.22	88.49	−0.8
Paving asphalt, cars, ton	15.48	15.57	+0.6	15.48	15.48	0.0	15.07	15.57	+3.3

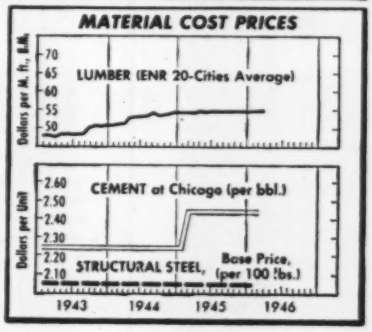


MATERIAL SHIPMENTS . . . . BUILDING PERMITS

	January 1945	January 1946	% Change	Dec. 1945	% Change Dec.-Jan.
Steel (% operating capacity) A.I.S.I.	90.5	42.2	−53	77.3	−45

	November 1944	November 1945	% Change	11 months 1944	11 months 1945	% Change
Fabricated Structural Steel, tons, A.I.S.C.	59,373	59,935	+1.0	536,599	687,500	+28
Cement, thous. bbl. U. S. B. of Mines	.....	.....	.....	.....	.....	....

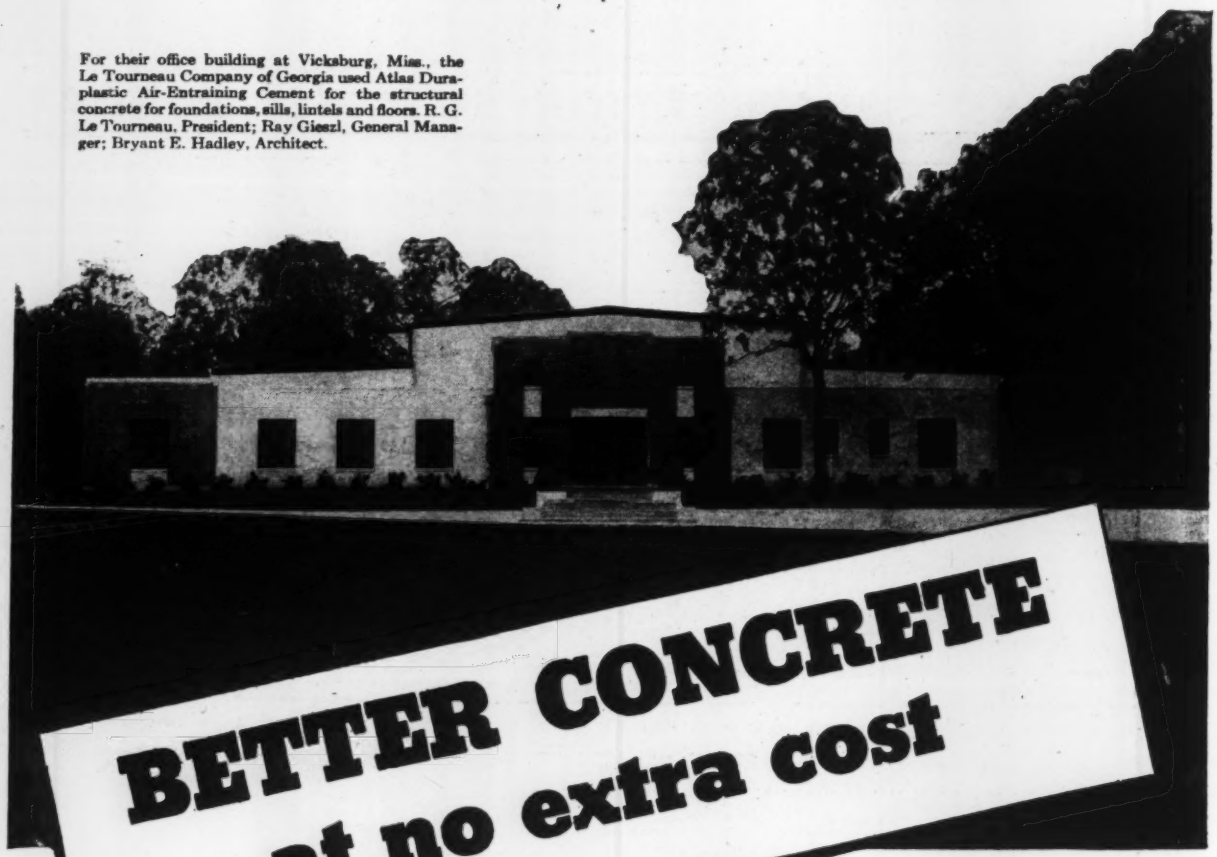
	December 1944	December 1945		12 months 1944	12 months 1945	
Building Permits, 215 cities, Dun & Bradstreet (,000 omitted)	39,433	188,092	+377	815,545	1,242,104	+52



COST OF LIVING INDEX . . . . CIVIL NON-AGRICULTURAL EMPLOYMENT

	November 1944	November 1945	% Change	Oct. 1945	% Change Oct.-Nov.
Cost of Living Index, N. I. C. B.	105.3	106.7	+1.3	106.3	+0.4
Rent (Housing) Index, N. I. C. B.	91.0	91.0	0.0	91.0	0.0
Total Employment (est.) thous., B. L. S.	38,347	35,620	−7	35,207	+1.2
Constr. Employment (est.) thous., B. L. S.	629	993	+58	990	+0.3

For their office building at Vicksburg, Miss., the Le Tourneau Company of Georgia used Atlas Duraplastic Air-Entraining Cement for the structural concrete for foundations, sills, lintels and floors. R. G. Le Tourneau, President; Ray Gieszl, General Manager; Bryant E. Hadley, Architect.



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News of the Week

ENGINEERING NEWS-RECORD • FEBRUARY 7, 1946 • VOLUME 136 • NUMBER 6

Highway research program hailed as major advance

Research Correlation Service of Highway Research Board will act as clearing center for activities of major engineering bodies, annual meeting hears

The Highway Research Board's recently-announced plan for correlation of research among major highway engineering bodies is one of the most progressive steps ever taken in this field, engineers said last week.

The correlation program seeks to formulate a definite program of research, visualize the problems of highway technology and determine which of the many fields involved require further research.

Speaking before the 25th annual meeting of the board, held at Oklahoma City, Okla., Jan. 25-28, Herman A. MacDonald, president of the American Association of State Highway Officials, strongly endorsed the correlation program.

"The chief job of this program," Mr. MacDonald said, "is to help the research agencies of the states, the federal government, colleges and industry in carrying out research programs related to highway construction problems—solutions of which are needed right now."

Fred Burggraf, associate director, and Roy W. Crum, board director, will be in general charge of the research program.

Mr. Crum said that in order to correlate planning steps and achieve objectives of the program, a Research Correlation Service has been set up to act as a central agency in ascertaining what problems need immediate attention, and what facilities are available at numerous research agencies throughout the country.

Technical representatives of the service will visit state highway departments, engineering colleges, and other agencies concerned with research. Additionally, a greatly expanded program of study by committees of qualified experts, and an increase in publication and distribution of worthwhile information will be sponsored.

As a preliminary step, the board mailed questionnaires to the states last fall, urging them to suggest problems in which they were most interested. Nineteen states replied, with a total of 115 suggested research problems.

Need is great

The entire final day of the Oklahoma City meeting was devoted to discussion of these and many other projects in simultaneous meetings of the board's six departmental committees.

In these discussions, it was pointed out that factors affecting the durability of all types of highway pavement are only imperfectly understood, and that the entire matter of bituminous materials needs intensive investigation. Some states believe they do not know how to write definitive specifications for asphalt, nor how to design bituminous mixtures scientifically.

Other matters stressed as subjects for intensive research included: Information on the relation of water to bearing capacity as well as stability of soils and granular mixtures and to compaction of embankments; effect of heavy vehicle loads on pavements and subgrades; erosion; roadside planting and shoulder treatment; joints in concrete pavements, including joint fillers, and scaling of concrete pavement.

Joints in pavement

Perhaps the most widely-discussed subject at the 4-day session was that on joints in concrete pavements. Speakers raised the questions of installation, spacing, prevention of pavement pumping at expansion joints, transfer of live load across the joint, and types of filler.

In response to a request for his views,

(*Continued on p.* 102)

Chicago to fight sewage process award

Attorneys for the Chicago Sanitary District plan an appeal to the U. S. Circuit Court of Appeals to contest a judgment for compensatory damages of $950,000 awarded to Activated Sludge, Inc., of Chicago, in a 15-page opinion filed Jan. 26 by Judge Walter C. Lindley, of the U. S. District Court for Northern Illinois, eastern division.

The opinion comprised the accounting phase of a decree given in 1935 by the same judge in a suit brought by Activated Sludge, Inc., against the sanitary district for infringement of sewage treatment patents.

Ernest Beuhler, chief attorney for the sanitary district, said an appeal will be made. If necessary, he added, the decision will be fought by the sanitary district up to the U. S. Supreme Court.

The case has been in litigation since 1924, when the corporation instituted suit over patents covering a process used by the district for speeding artificial treatment of sewage through rapid oxidation, employing bacteria known as Bacaillus M7. The district has been using the process in its sewage treatment plants since 1922. The patents expired in 1935.

In his opinion, Judge Lindley said that the district has received value from the patents as a result of lessons learned in advanced methods of the treatment of sewage. The plaintiff claimed that the sanitary district had saved as much as $11,053,790 through the use of its patents.

Other cities have paid

During the years since suit first was brought against the Chicago Sanitary District, the plaintiff has collected damages from all other municipalities which it charged with infringement. These cases totaled about 125 in number, largest settlement being made by Milwaukee, for about $815,000, agreed upon out of court after a judgment had been entered against the city for nearly $5 millions. The gross sum collected from all other defendants came to about $600,000, it was reported.

NEWS IN BRIEF

In telegraphic form, here are latest news developments on the engineering and construction front during the week.

Housing—The *Baltimore, Md.*, Association of Commerce reported that local builders have plans ready for 10,000 housing units. . . . *Toledo, Ohio,* housing officials completed a survey which showed need for 6,000 units. . . . Western Illinois State Teachers College, at *Macomb* requested federal aid in providing homes for 50 married students and 150 single men. . . . Northwestern University began work on a $2,000,000 apartment hotel on its campus at *Evanston*. . . . Mayor William F. Devin of *Seattle, Wash.*, and Gov. Frank Lausche of *Ohio* called for "drastic revisions" of building codes to aid housing construction. . . . *Montgomery County, Indiana,* veterans service units bought 22 unused grain bins for conversion into temporary homes.

Bond Issues—*Seattle, Wash.*, set up for submission in the spring a $5,500,000 issue to finance a new health and police department building, and a $3,000,000 issue for sewer work.

Highways—*North Carolina* planned a $600,000 highway bridge over French Broad River near Asheville. . . . *Florida* looked toward eventually eliminating tolls on the Overseas Highway, after the state signed a lease-purchase agreement to take over the 40-mile stretch of roads and bridges. . . . *Ohio* announced it would begin work on improvement of 12,000 miles of secondary roads in the spring. . . . *Arkansas'* 1946 highway construction program has been approved by PRA, and state officials said they were ready to proceed with 29 projects, to cost $3,710,000. . . . *Kentucky* awarded $2,000,000 in contracts to get its 1946 program under way.

City streets—*Columbus, Ohio,* considered building a new asphalt plant to supplement one now reported "worn out". . . . *Baltimore, Md.*, considered a $5,000,000 bond issue to finance resurfacing programs. . . . *Columbia, S. C.*, began a downtown traffic survey, preliminary to making plans for speeding movement.

Water Supply—*Jackson, Miss.*, began construction of a million-gallon storage tank and a new water intake system on Pearl River. . . . *San Diego, Cal.*, announced plans for a $2,000,000 water purification plant, to handle 66 m.g.d. . . . Residents of *Gallipolis, Ohio,* were asked to conserve water, pending repairs to pumping station machinery.

Sewage Disposal—*Oklahoma City, Okla.*, received FWA funds for planning a $2,774,000 South Side sewage treatment plant. . . . *Hamilton County, (Cincinnati) Ohio,* planned a $20,000,000, 10-year sewer program.

Construction—A $1,450,000 union truck terminal was proposed for Louisville, Ky. . . . W. T. Grant Co. scheduled a $2,000,000 store at *Rochester, N. Y.* . . . *San Bernardino County, Calif.*, planned a $1,100,000 courthouse. . . . Two hotels, to cost a total of $3,000,000 were announced for *Miami Beach, Fla.*

Highway Research

(*Continued from* P. 101)

Frank T. Sheets, president of the Portland Cement Association, said it was his opinion that even under the worst conditions such joints could be installed at 400-ft. intervals without seriously exceeding safe stresses. Under normal conditions, this spacing might very well be extended to 600 or 800 ft.

Field research

H. E. Hilts, deputy commissioner Public Roads Administration, urged the use of the thousands of miles of roads that have been built in the last 25 years as a practical testing ground for accumulation of mass statistical evidence of stresses, deformations and subgrade reactions due to loads and weather conditions. Accurate knowledge of fatigue of concrete pavements should permit application of steps that would materially conserve and extend their life, Mr. Hilts added. This knowledge might be obtained by a pavement fluoroscope or other apparatus designed to show defects not visible on the surface.

"To record behavior of subgrades, pavements and surfaces requires the development of sensitive equipment to record the movement. Such development should not be considered insurmountable, and its cost should prove insignificant in comparison with returns."

Bridge design study

E. F. Kelley, chief of the division of physical research and tests, PRA, urged the need for additional research in bridge design, in the interest of economical design.

"Available records indicate that little experimental observation of the effect of dynamic loading on the stresses in highway bridges have been made since 1925," Mr. Kelley said. "Consequently, studies are needed to determine the effect of dynamic loading on the stresses in highway bridges caused by heavy modern vehicles.

Long experience in the use of plate girders has resulted in formulation of empirical limitations on design, but these rule-of-thumb limitations have not been adequately substantiated by experimental data. These design limitations have an important influence on costs."

Roadside development

The committee on roadside development, headed by H. J. Neal, proposed a tentative road-shoulder design. Briefly, it is a cross-section of varying degrees of slope. For a 15-ft. shoulder width, the first five feet should slope ¾ in. per foot, the next five feet should be sloped 1½ in. per foot, and the outer 5-ft. width may be safely graded to 3 in. per foot. These same degrees of slope may be used for narrower shoulders by dividing the total shoulder width into three equal sections. Another suggestion presented was that the finished road shoulder be started from ½ to 1 in. below the top of the pavement to allow for future building-up.

Convention awards

One of the highlights of the general session was the presentation of the George S. Bartlett Award, given annually for outstanding contribution to national highway progress, to Frederick E. Everett, commissioner, New Hampshire State Highway Department. George H. Henderson, principal highway engineer, Department of Public Works, Rhode Island, presented the award.

D. W. Loutzenheiser, senior highway engineer, Public Roads Administration, Washington, D. C., received the Highway Research Board Award for 1944, for his outstanding paper on, "Proposed Design Standards for Interregional Highways", published in the 1944 *Proceedings* of the Highway Research Board.

R. L. Morrison, professor of highway engineering, University of Michigan, was elected chairman of the Highway Research Board, succeeding Stanton Walker, Washington, D. C., and F. V. Reagel, engineer of materials and tests, Missouri State Highway Department, was elected vice president.

The Washington, D. C., staff has been greatly expanded to handle the board's increased activities, reported Mr. Crum. New staff members include: A. W. Johnson, F. N. Wray, G. A. Rahn and Wainwright Bridges. Mr. Crum announced the promotion last fall of Fred Burggraff to be associate director of the board.

A report of the annual meeting of the American Association of State Highway Officials, which followed the Highway Research Board meeting, will be given in next week's issue.

AED seeks end of government control, voluntary self-regulation of industry

Resolution asks Truman for return to competitive status—Speakers at Chicago meeting see bright construction future

Voluntary self-regulation of the industry, with the corollary of removal of governmental controls, is the key to a healthy, competitive business structure in a democratic economy, members of the Associated Equipment Distributors decided at their 4-day convention in Chicago last week.

More than 1,400 persons who attended expressed vigorous approval of statements by Senator Wayne L. Morse, of Oregon, and other speakers who opposed the use of government compulsion in labor-management difficulties, and control over inter-business competition.

The meeting, held at Chicago's Edgewater Beach Hotel, was saddened in its final sessions when, during ceremonies installing Frank B. McBath, of Portland, Ore., as president, word was flashed to the assembly that Hamilton O. Penn, 49, retiring president, had died in his hotel room of a heart attack.

Sounding the dominant note of the convention, Senator Morse told his listeners that the United States must maintain an "economic democracy, unequivocally . . . . the capitalist or profit system —a private property economy."

"A compulsory arbitration tribunal like the War Labor Board should end as soon as possible," Senator Morse said. "Today, we have in effect a general strike for which both sides in the dispute share responsibility. Government has an obligation to . . . . break the deadlock in the public interest.

"However, first choice in settling any such (labor-management) dispute is free negotiation. Second is for both sides to take the risks of voluntary arbitration, which should be written into all labor contracts, as a safeguard against government encroachment . . . . and contracts should be enforceable against both employers and labor."

Crystallizing obvious sentiment in accordance with the legislator's views, the convention sent a formal telegram to President Truman requesting, among other matters, that the construction equipment industry be permitted to resume its prewar, highly competitive position, without government regulation.

Building outlook is good

Two views of the immediate future of the construction industry presented a prospect of rapidly increasing business.

Harry A. Dick, of Portland, Ore., president of the Associated General Contractors, said that AGC "hopes" within a few years to see annual construction volume equal to more than 10 percent of the national income, providing jobs for some 10 million workers.

He said AGC expects construction volume for 1946 to reach $12 billion.

In a more conservative vein, Albert E. Paxton, publisher of *Engineering News-Record* and *Construction Methods*, saw construction totalling $5 billion in 1946, and continuing upward to reach $15 billion annually by 1949.

Engineered construction, Mr. Paxton said, should approximate two-thirds of the total of all construction during the 4-year period and reach $10 billion by 1949. To attain a peacetime normal of $15 billion total construction, he declared, an average gain of 50 percent in volume each year through 1949 is indicated.

Hamilton O. Penn dies, was AED president

Hamilton O. Penn, 49, president of the H. O. Penn Machinery Co., Inc., of New York City, and retiring president of the Associated Equipment Distributors, died suddenly in Chicago Jan. 31.

Mr. Penn had been attending sessions of the annual meeting of the AED, which ended on the day of his death.

Hamilton O. Penn

Long a leader in the equipment distribution field, Mr. Penn, a native of Hartland, Wis., became head of his own company in the early 1920's.

Mr. Penn specialized in contractors' machinery and expanded his service to include many lines of equipment and to three branch offices in the East, in addition to the main plant in the Bronx. For a time, he owned the Michigan Tractor and Equipment Co., and at his death, was an officer of the Tyson Roller Bearing Co., of Massillon, Ohio.

During the war years, he was at one time chief of the used construction machinery division of the War Production Board, making an inventory of all used construction equipment for war purposes.

Surplus disposal

Reporting for the association's Committee on Disposal of Government Surplus, William A. Danner, of Hyde Park, Mass., said that the AED will cooperate with the Reconstruction Finance Corporation and its subsidiaries to complete a plan comparable to that already in effect for the machine tool industry. Under this plan, certified dealers are allowed a 12½ percent commission on authenticated sales to buyers of machine tools from government surplus; the tools themselves do not pass through the hands of the dealers.

Col. John S. Cooke, vice president, War Assets Corp., said all machines in government surplus carry fixed prices. It is impossible to apply a similar formula to construction machinery, however, Col. Cooke said.

He added that, although his organization and the AED committee are attempting to promote quick disposal of surplus construction equipment, it probably would be late in February before synchronized spot sales are resumed. New equipment will be sold on a fixed-price basis, and used equipment by taking bids in these sales.

With reference to repair parts, Col. Cooke said he hoped a definite announcement of policy could be made soon. Agreeing with an earlier statement by Mr. Danner, he said that surplus repair items may total $200 million.

Discussing these reports, members suggested that veterans be placed on equal priority footing with government bodies, or that government priorities should be eliminated completely, while veterans retained preference.

George H. McKean, chief, materials disposal section, U. S. Maritime Commission, reported on disposal of the relatively much smaller surplus in the commission's possession.

Trade practice rules

Steps to be taken in promulgating trade practice rules for the industry were explained by Henry Miller, director, trade practice conference division, Federal Trade Commission. Mr. Miller said tentative rules are first studied by FTC

(*Continued on p.* 104)

Foreign governments reveal building plans

Need for housing, essential services shown as nations plan expenditures for varied new construction

Faced with the pressing need for construction to provide housing and essential services to their peoples, many foreign governments recently have announced extensive construction plans.

Some of these plans are detailed in the review and forecast sections of this issue of *Engineering News-Record*, and among later plans reported are:

Sweden—The Swedish government has hired engineers to prepare plans for $19,108,000 worth of water supply and drainage projects; $13,600,000 of agricultural improvement projects; $63,706,000 in private construction supported by government financial aid, and to erect 45,000 dwelling units.

France—In association with the government of Switzerland, the French government states it will build an airport at Blotzheim, Alsace, to cost about $4,446,000. The new airport will have an area of about 600 acres, and three runways, each 6,500 ft. long will be constructed. The project is to be financed jointly by the two governments.

England—Among many projects reported in England are: a water pipeline from Lake Vyrnwy in Montgomeryshire to Liverpool, a distance of 68 miles, to cost about $5,062,000; a water supply system to cost about $1,529,000 for the town of Kerrier; and $832,500 for a water supply system for St. Faith. In addition, the Imperial Chemical Industries Ltd., of London, said it had purchased a 3,500 acre site for construction of an organic chemical plant, total cost of which will be about $45,000,000.

Turkey—Canadian and American Engineering and construction firms have been invited to consult plans and specifications for the development of the Turkish Black Sea ports of Eregli and Trahzou, to be built at a cost of about $5,000,000. Plans are available at the Foreign Construction Unit, Department of Commerce, Washington, D. C.

Russia—The Russian government announced it was preparing plans for the installation of moving sidewalks, modelled on escalators, at Kiev, former capital of the Ukraine.

Ecuador—The Export-Import Bank of Washington granted an increase of $780,000 in a line of credit granted to Ecuador to assist in financing the section of the Pan American Highway between Guamote and Tambo, and a lateral road from Tambo to Duran.

Mexico—Mexican construction plans, both by private and public agencies, continue to mount rapidly. The federal government said that it would spend $4,000,000 for a hospital in Mexico City; launch a $20,000,000 bond issue to equip and extend government owned sugar mills, including two new structures in Sinaloa and Tamaulipas States; spend $10,000,000 for highway improvements. The State of Vera Cruz said it would spend $5,000,000 on public works. Private investors, meanwhile, will seek the establishment of about 450 new industries within Mexican borders during the coming year, according to the government newspaper, *El Nacional*.

Puerto Rico—The Arecibo Housing Authority recently received sealed bids for the construction of a new housing project to include housing units of reinforced concrete, a community center and nursery school buildings. Meanwhile, an island-wide public works program calls for the investment of more than $2,000,000 for general public works.

Gen. T. B. Larkin named Quartermaster General

Maj. Gen. Thomas B. Larkin has been confirmed as Quartermaster General of the Army, with the rank of major general, to succeed Lt. Gen. Edmund B. Gregory, recently appointed to supervise disposal of surplus materials as chairman of the board of the War Assets Corporation of the Reconstruction Finance Corporation.

Gen. Larkin

General Larkin, who was formerly commanding general of the Second Service Command, Governor's Island, New York City, was commissioned in the Corps of Engineers at West Point in 1915. He served abroad during the first World War, returning in 1919 as an instructor in the Engineer School. He served for a period as assistant military attache at the American Embassy in Tokyo.

From 1933 to 1937 he was district engineer of the Fort Peck district, in charge of all work on the Missouri River and its tributaries above the Yellowstone River.

In 1942, General Larkin was assigned to headquarters, Army Air Forces, at Washington, D.C., and in February of 1943, he was made commanding general, Service of Supply, North African Theater.

When American forces invaded Southern France in 1944, he was commanding general of the S.O.S. of that operation.

AED Seeks Control End

(*Continued from p.* 103)

for conformity with existing statutes, then submitted to each AED member for review and comment, then discussed in public hearings, and finally re-submitted to members in revised form.

Lachlan MacLeay, president, Mississippi Valley Association, expressed strong disapproval of the plans now before Congress to establish a Missouri Valley Authority on the lines of TVA.

Other speakers included Gene Flack, director of advertising for the Loose-Wiles Biscuit Co., New York City, who said that a reservoir of more than $100 billion in spendable income now awaits salesmen and S. E. Wardell, advertising manager of the H. O. Penn Machinery Co., who analyzed the means available to the individual distributor for effective promotion.

National officers installed at the meeting were: F. B. McBath, president; W. A. Danner, executive vice-president; A. F. Garlinghouse, Los Angeles, Calif., C. F. Halladay, Sioux Falls, S. D., and Walter J. Kane, Winnepeg, Man., vice-presidents; W. W. Bucher, New York City, treasurer, and C. F. Winchester, Washington, D. C., executive secretary.

Directors (by districts) are: W. A. Danner, H. J. Hush, G. N. Crawford, R. H. Carter, Albert E. Hahnen, Clare Williams, G. W. Swart, C. F. Halladay, James W. Bell, H. L. Burleson, A. F. Garlinghouse, Mr. McBath, W. B. Clark, Pat Norris, W. J. Kane.

States assure builders on steel-strike loss

The Texas State Highway Department last week assured contractors that it will not penalize them for losses of time due to widespread strikes in the steel industry. In a circular issued at Austin, the department said that if the inability to obtain steel products should make it necessary for contractors to suspend or substantially curtail operations on highway department contracts, the contract time charges will be suspended and contractors will not be considered in default of contracts for the period during which such essential materials are not available.

Alabama also gave assurance to contractors that possible rises in the price of steel would not jeopardize their position. G. R. Swift, highway director, said the state would accept bids on highway work, with the provision that subsequent increases in OPA ceilings on structural steel would be added to the contract price.

President recommends moderate start for federal construction program

Annual message clarifies chief executive's views on river valley authorities, housing, timing of construction

Federally-sponsored construction should go forward at a moderate rate to avoid inflationary prices and to permit private work to proceed at the maximum possible volume President Truman emphasized Jan. 21 in his annual message to Congress. At the same time he recommended a national budget that contained $875,000,000 for construction work (*ENR* Jan. 31, vol. p. 147) which compares favorably with pre-war budgets.

Several other recommendations of major importance to the construction industry were outlined by the President. Many of these matters are already before Congress in some form (*ENR* Jan. 31, vol. p. 151):

(1) Passage of pending legislation providing federal help for construction of airports; (2) Legislation providing federal aid for building public hospitals and other health facilities; (3) Federal assistance to relieve the housing shortage and establishment of the National Housing Agency as a permanent organization; (4) Authorization of a program to increase federal grants and loans for water pollution control facilities; (5) Creation of a federal program providing comprehensive assistance for scientific and engineering research; (6) Early action on pending legislation substantially raising minimum wages.

Timing of construction

Mr. Truman considers the timing of the start of postwar federal construction projects of great importance. "In resuming public works construction," he said, "it is desirable to proceed only at a moderate rate, since demand for private construction will be abnormally high for some time. Our public works program should be timed to reach its peak after demand for private construction has begun to taper off. Meanwhile, however, plans should be prepared if we are to act promptly when the present extraordinary private demand begins to run out."

"Specifically," he added, "the federal government should aid state and local governments in planning their own public works programs, in undertaking projects related to federal programs of regional development, and in constructing such public works as are necessary to carry out the various policies of the federal government."

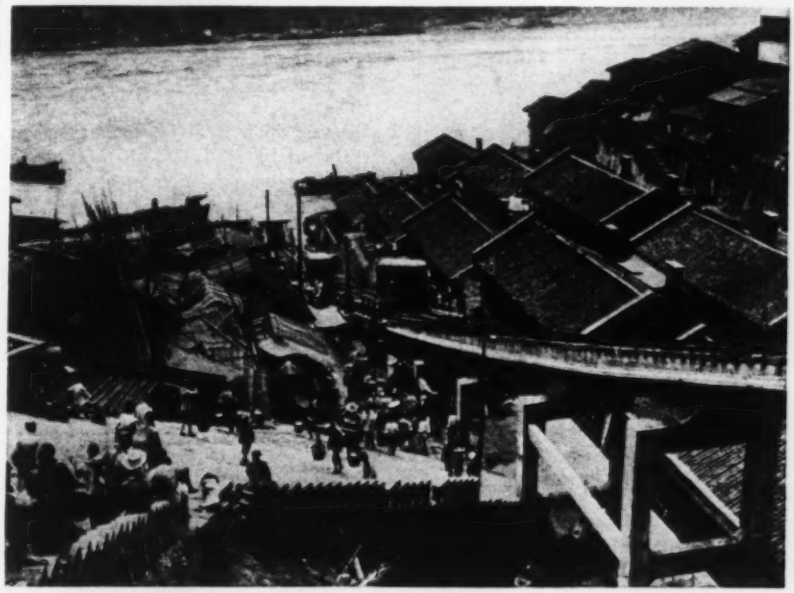
The benefits of making NHA permanent were outlined as follows, "This legislation . . . would give it (NHA) authority and funds for much needed technical and economic research. It would provide additional stimulus for privately financed housing construction. This stimulus consists of establishing a new system of yield insurance to encourage large-scale investment in rental housing and broadening the insuring powers of the Federal Housing Administration and the lending powers of the federal savings and loan associations. . . . The bill would encourage expansion in housing available for the lowest income groups by continuing to provide direct subsidies for low-rent housing and rural housing. It would facilitate land assembly for urban redevelopment by loans and contributions to local public agencies where the localities do their share."

River authorities

Mr. Truman also clarified his views concerning river authorities. He said, "Through the use of the waters of the Columbia River, for example, we are creating a rich agricultural area as large as the State of Delaware. At the same time, we are producing power at Grand Coulee and at Bonneville which played a mighty part in winning the war and which will found a great peacetime industry in the Northwest. The Tennessee Valley Authority will resume its program of promoting full use of the resources of the valley. We shall continue our plans for the development of the Missouri Valley, the Arkansas Valley and the Central Valley of California.

"The Congress has shown itself alive to the practical requirements for a beneficial use of our water resources by providing that preference in the sale of power be given to farmers' cooperatives and public agencies. The public power program thus authorized must continue to be made effective by building the necessary generating and transmission facilities to furnish the maximum of firm power needed at the wholesale markets, which are often distant from sites."

Frankfort, Ky.—Governor Simeon Willis of Kentucky has announced his opposition to proposed state legislation to divert highway funds to the Aeronautics Commission (*ENR* Dec. 27, 1945, vol. p. 853) but has no objection to that group putting before the state's general assembly its request for the transfer of $500,000 a year from the highway fund for the construction of airports.



Chungking "Elevated" ends long stair climb

This cable tramway, connecting the Yangtse River ferry landing with the main part of the city on a bluff above the river, has recently been completed in Chungking, Chinese capital.

About 2,400 ft. long, the cable-cars eliminate use of the long stone stairway (at left) which contains some 360 steps. Mounted on poured-concrete columns, the elevated roadbed provides two meter-gage tracks and is equipped with two Chinese-built steel cars, each accommodating 42 passengers.

Estimated construction cost was $3,600,000.

Calendar of Meetings

NATIONAL

American Concrete Institute, 42nd annual convention, Hotel Statler, Buffalo, N. Y., Feb. 18-21.

Associated General Contractors of America, Inc., Chicago, Ill., Feb. 18-22.

American Society for Testing Materials, spring meeting, Hotel William Penn, Pittsburgh, Pa., Feb. 26-27.

American Society for Testing Materials, committee week, Hotel William Penn, Pittsburgh, Pa., Feb. 25-March 1.

National Society of Professional Engineers, conference of state presidents of member state societies, and board of directors meeting, Deshler-Wallick Hotel, Columbus, Ohio, March 29-30.

REGIONAL

Ontario General Contractors Association, annual convention, King Edward Hotel, Toronto, Ont., Feb. 8.

Ohio Society of Professional Engineers, annual convention, Akron, Ohio, Feb. 14-15.

Iowa Engineering Society, annual meeting, Fort Des Moines Hotel, Des Moines, Ia., Feb. 19-20.

New Jersey Section, American Water Works Association, winter meeting, Hotel Roger Smith, New Brunswick, N. J., Feb. 21.

Minnesota Federation of Engineering Societies, victory convention, Hotel Radisson, Minneapolis, Minn., Feb. 21-23.

Wyoming Engineering Society, annual meeting, USO Building and Plains Hotel, Cheyenne, Wyo., Feb. 22-23.

Ontario Good Roads Association, annual convention, Royal York Hotel, Toronto, Ont., Feb. 26-27.

Ontario Roadbuilding Association, annual convention, Royal York Hotel, Toronto, Ont., Feb. 27.

Michigan Highway Engineering Conference, Grand Rapids, Feb. 26-28.

Pacific Southwest Section, Society for the Promotion of Engineering Education, annual meeting, Berkeley Campus, University of California, Feb. 22-23.

Minnesota Section, American Water Works Association, Radisson Hotel, Minneapolis, Minn., March 14-15.

New York Section, American Water Works Association, Mark Twain Hotel, Elmira, N. Y., March 28-29.

Buffalo, N. Y.—Work has been started on an "ultra-modern" 12-story department store for J. N. Adam & Co. It will have helicopter-landing facilities, television, and an air beacon visible for 150 miles, and an underground garage.

Flexible codes needed, construction men told

Building codes flexible enough to accept new materials and be fair to labor crafts, manufacturers and constructors, are a major need in the United States today, according to speakers at the second annual Building Industry Conference held at Iowa State College, Ames, Iowa, recently.

Bert J. Westover, director of the administrative building council of Indiana, pointed to the Indiana code as an example of flexibility. "This code specified standards for materials, but if any material can come up to the standards—with laboratory tests as proof—that material will be admitted under the code," Mr. Westover said.

Frank Kerekes, civil engineering professor at the college, presided at the two-day session. Other speakers included: Henry Penn, district engineer for the American Institute of Steel Construction; A. H. Weiters of the Iowa Department of Health; Donald D. King, assistant editor of Construction Methods; Chesley Posey, associate professor of hydraulics and structures, Iowa University; and T. R. Agg, dean of the State College engineering school.

Costs high, state cuts planned highway work

Increasing costs of construction last week resulted in announcement by two states that their planned road programs would be reduced.

The Arkansas Highway Commission said that bids received January 21 on several of its road projects were in excess of engineers' estimate costs by from 6 to 36 percent.

Commenting that the mileage of proposed road construction will be reduced, Governor Ben Laney said that he "did not blame contractors because they do not know themselves what future prices will be."

The Montana Highway Commission said that unsettled conditions in the materials and manpower fields were reflected in a January letting of nine road and bridge contracts. The commission said that not one Montana contractor submitted a bid, and the lowest bid submitted was 75 percent above the estimate.

The steel strike, which began Jan. 21, will make it necessary to defer virtually the entire public works and permanent housing program planned by New York State, Charles H. Sells, commissioner of public works, said at Albany.

The threat of a strike, Mr. Sells said, is sufficient in itself to prevent contractors from submitting bids for bridge construction. The contractors, he added, had been unable to get commitments on price or delivery from steel manufacturers.

The state had planned to let contracts this year for about $40,000,000 in institutional buildings and $125,000,000 in highway construction and reconstruction.

Canadian contractors elect new officers

Albert Deschamps, contractor of Montreal, was elected president of the Canadian Construction Association at its recent annual meeting in Winnepeg, Man. Mr. Deschamps is a graduate civil engineer of McGill University and has operated his own construction business in Montreal since 1922. He is a member of Canada's National War Labor Board and has served as president of the Montreal Builders Exchange.

He succeeds H. C. Nicholls, of Toronto. A. C. Ross, of Ross Meagher Limited, Ottawa contractors, was elected vice-president at large, with the following as regional vice presidents: P. M. Gross, Quebec; R. Drummond, Ontario; M. Bickle, Maritimes; E. E. Lord, Western; and E. R. Gilley, Pacific Coast.

Merriman Dam bids

Bids are asked Feb. 26 on revised specifications for completion of Merriman Dam of the New York Board of Water Supply. Bids taken Sept. 11, 1945, (*ENR* Sept. 27 vol. p. 400) were rejected. Uncertain labor conditions and "difficult" rolled-fill requirements made the $13,919,950 bid higher than anticipated. Labor conditions now have stabilized and the rolled-fill clauses have been eased.

Two new communities spring up at Davis Dam

The Bureau of Reclamation estimates that 2,000 men will be housed at the new federally-built community near Davis Dam in Arizona. Bids for the contract for streets and other facilities were opened at Kingman, Ariz., on Jan. 17. Charles J. Dortman, Los Angeles, Calif., was low bidder with an offer of $214,251.

Another community, to be known as Bull's Head City, is also being established to provide housing for several hundred workers.

It will require three to four years to build the dam. (*ENR*, Jan. 10, vol. p. 16).

OBITUARY

Albert L. Kendall, 86, died at Framingham, Mass., Jan. 23. He was graduated from Massachusetts Institute of Technology in 1894, and was a well known fire protection engineer, having been long associated with the Associated Factory Insurance Co. of Boston, retiring from active practice 10 years ago.

Albert Davis Merrill, 62, engineer for the Portland, Ore., Dock Commission, died Jan. 17.

Walter E. Brown, 63, died in Montclair, N. J., Jan. 18. He was a civil engineering graduate of Lehigh University. He was with the bridge department of the Delaware, Lackawanna and Western R. R. for many years before joining Ebasco Services, Inc.

Paul A. Babcock, 67, a civil engineer, formerly associated with the New Orleans, La., drainage project, died in Milton, Mass., Jan. 22. He was graduated from Massachusetts Institute of Technology in 1900.

Norman C. Hooper, 56, a civil engineer in the Massachusetts Department of Public Works, died Jan. 21, at Lexington, Mass. He was a graduate of Norwich University.

Charles A. Kingsbury, civil engineer formerly with the Yonkers City Engineer's Office, died Jan. 21, in Yonkers, N. Y.

Dwight C. Morgan, 78, Kittanning, Pa., retired civil engineer of the Pittsburgh and Shawmut Railroad, died Jan. 23.

John S. Conway, 67, a civil engineering graduate of the University of Pennsylvania and former deputy commissioner of federal lighthouses, died Jan. 21 in Takoma Park, Md. He joined the U. S. Reclamation Service, now the Bureau of Reclamation, in 1905. In 1910 he was appointed chief construction engineer in the U. S. Lighthouse Service, later serving for 17 years as deputy commissioner and retiring in 1930.

Thomas D. Miller, 86, a retired St. Louis, Mo., consulting engineer, died in Grand Rapids, Mich., Jan. 28.

George L. Phelps, 40, chief of operations for Del. E. Webb Construction Co., Phoenix, Ariz., died there Jan. 21.

G. Walter Jones, for many years head of the civil engineering firm of G. W. Jones & Sons, Huntsville, Ala., died in Tuscaloosa, Ala., Jan. 14.

Henry G. Perring, 64, head of the Bureau of Harbors, Baltimore, Md., died Jan. 25. He was a civil engineering graduate of Drexel Institute, Philadelphia, Pa., became a construction engineer with the Philadelphia and Reading R. R., and later was a structural engineer in the Philadelphia Navy Yard. He was a colonel in the construction division of the Quartermaster Reserve in the first world war. From 1920 to 1922 he was chief engineer of Baltimore, and later was supervising engineer of the Public Improvement Commission.

Charles C. Kirby, 66, died at St. John, N. B., Jan. 24. He was first president of the Dominion Council of Provincial Associations of Engineers in 1936.

New Westinghouse head is Gwilym A. Price

Gwilym A. Price has been elected president of the Westinghouse Electric Corp. to succeed George H. Bucher, who has resigned. Mr. Price will be the chief executive officer.

A. W. Robertson, who as chairman has been chief executive officer since 1929, has reached retirement age. He has been elected chairman of the board of directors and will continue in a less active capacity.

Mr. Bucher was elected vice chairman of the board and will continue as chairman of Westinghouse Electric International Co., which handles all export business of the parent concern.

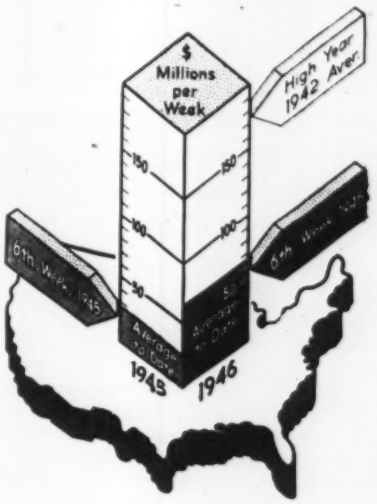
Davis Dam contract is formally awarded

The Bureau of Reclamation has announced the formal awarding of the contract for the completion of Davis Dam, near Kingman, Ariz. (*ENR* Jan. 10, vol. p. 16). Contract unit prices for the project are given on p. 174 of this issue.

Associated with the Utah Construction Co. in the $21,462,505 contract are: Morrison-Knudson Co., Boise, Idaho; General Construction Co., Seattle Wash.; Kaiser Co., Oakland, Calif.; Pacific Bridge Co., Modglin-Kahn Corp., and J. H. Pomeroy Co., San Francisco, Calif.; Winston Bros., Minneapolis, Minn., and Raymond Concrete Pile Co., New York.

Work on the dam had been stopped by the War Production Board in 1942.

CONSTRUCTION ACTIVITY



As Reported this week to...
Engineering News-Record

CONTRACT VOLUME

Continental U. S. Only (Thousands of Dollars)

	Week of Feb. 7 1946	Cumulative 1946 (6 wks.)	Cumulative 1945 (6 wks.)
Federal	$2,411	$42,584	$69,688
State & Mun.	16,468	87,109	19,478
Total Public	$18,879	$129,693	$89,166
Total Private	36,648	274,111	48,334
U. S. Total	**$55,527**	**$403,804**	**$137,500**

WHERE CONSTRUCTION ACTIVITY ORIGINATED THIS WEEK

Type of Work	Dollar Volume (Thousands) This Week	Cumulative 1946 (6 wks.)	Cumulative 1945 (6 wks.)
Waterworks	$1,048	$6,346	$4,640
Sewerage	594	3,047	4,121
Bridges	2,130	12,289	5,018
Highways	9,811	45,767	9,276
Earthwork, Waterways	266	28,105	1,560
Buildings, Public	2,577	25,094	42,453
Industrial	7,942	114,736	30,668
Commercial	25,596	143,798	10,350
Unclassified	5,563	24,622	29,414

NOTE: Minimum size projects included are: Waterworks and waterway projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1946 (6 wk.)	Cumulative 1945 (6 wk.)
NON-FEDERAL	$103,797	$107,734
Corporate Securities	51,558	5,420
State and Municipal	52,239	102,314
FEDERAL	158,320	77,137
Total Capital	$262,117	$184,871

ENR INDEX NUMBERS

Index Base = 100		1913	1926
Construction Cost	Feb. '46	319.52	153.59
Building Cost	Feb. '46	243.94	131.86
Volume	Jan. '46	189	83

Many 1945 laws are of engineering interest

Seldom, if ever, in one year have so many federal bills of engineering interest been passed as in 1945. Appropriations for construction to advance both wars accounted for many of these measures, but the end of hostilities and the desire of Congress to permit an immediate start of a large peace-time construction program accounted for other important measures. The year 1945 was also peculiar in that some construction appropriations made during the year may not be used, as they were earmarked for war projects that are now unnecessary. No sooner had the 1945 session convened than Congress approved $1.5 billion for construction by the Navy, including nearly a billion dollars for advance bases. A few months later the Navy got an additional billion dollars, most of which was for advance base projects. A $21.5 billion appropriation for the War Department included large appropriations for military construction in this country and purchase of huge amounts of construction equipment. Many of those orders were cancelled later.

Several large appropriations for construction by other than war agencies were also made and late in the year Congress passed a difficiency bill that provided more than $600,000,000 for postwar construction. This money will permit the U. S. Army Engineers to start a program to cost eventually several billion dollars, the Bureau of Reclamation to get under way a $1½-billion program and the Veteran's Administration to continue a hospital construction program that calls for the award of $350,000,000 of contracts this year. Passage of the bill, which followed two large appropriations for the Federal Works Agency to assist local public works planning groups, also contained money for using 100,000 war housing units for veterans' housing.

Late in the year Congress also declared the war emergency sufficiently ended so that the $500,000,000 provided in the 1944 Highway Act for federal aid during the first year that the act was in effect should be made available.

Congress also approved without reservations the Mexican water treaty, and granted consent for a compact between Colorado and Kansas for the division of waters of the Arkansas River. An act clarifying control of the National Airport was also passed, as was a law authorizing that in view of the atomic bomb the Third Locks project for the Panama Canal be resurveyed before construction was resumed. More than a dozen laws pertaining to construction of bridges over navigable streams were also enacted.

Engineering News Events of 1945

PAGE NOS. JANUARY TO JUNE REFER TO VOL. 134; JULY TO DECEMBER TO VOL. 135

JANUARY

U. S. Geological Survey plans $15,000,000 water program (*p. 17*).

Potential waterway project total over $4 billion. (*p. 83*).

Apportionment of first $500 million in road funds announced (*p. 88*).

ASCE Cancels Meetings, adjusts schedules to meet travel restrictions (*p. 99*).

FEBRUARY

Equipment Men worry over means of disposing of government war surplus (*p. 145*).

"Pipeline to Victory" completed in Burma by U. S. Army (*p. 150*).

Ledo-Burma Road, now the Stilwell Road, opened to aid China (*p. 151*).

Open Second Tube of Lincoln tunnel, in New York (*p. 154*).

National Planning Assn. suggests "Timed Public Works" to stabilize construction as soon as possible (*p. 227*).

First regular surplus equipment sale set at Kearney, Neb. (*p. 229*).

Metropolitan Life files plan for $24 million N. Y. housing projects (*p. 230*).

Allies Capture five dams in Roer River, Germany (*p. 232*).

Propose $235 million flood control for Potomac River (*p. 244*).

MARCH

FWA Decentralization announced for greater public works control (*p. 299*).

Federal engineering agencies at odds over Pacific Coast river work. (*p. 300*).

A. H. Horton dies, was chief of power resources division, U. S. Geological Survey which he served for 42 years (*p. 302*).

Contractors Admit Payment to union chief to insure "smoothness" of Delaware aqueduct work (*p. 358*).

Remagen Bridge collapses, lost 10 days after capture (*p. 369*).

Army discontinues Canol project as unneeded but pipeline will be kept in condition, announcement says. (*p. 372*).

Ruml Suggests Government regulation of construction (*p. 418*).

China's Industrial and transport needs set at $1.8 billion (*p. 422*).

APRIL

Maj. Gen. Lucius D. Clay to direct German civil affairs (*p. 431*).

Rhine Railroad Bridge built by Army in 10 days (*p. 536*).

Engineers almost saved Remagen Bridge. Repairs were nearly completed (*p. 538*).

Los Angeles Votes $10,000,000 for new sewage treatment plant (*p. 542*).

Illinois Approves Chicago Transit Authority (*p. 544*).

Reclamation Bureau Plans $4.8 billion postwar work (*p. 549*).

Mississippi Flood waters within 2.7 ft. of all-time high (*p. 551*).

Lumber Scarcity hinders construction, especially home building (*p. 595*).

Boundary-Water Treaty with Mexico gets qualified Senate approval (*p. 596*).

Minnesota To Spend $6,000,000 for capital approaches (*p. 603*).

MAY

Construction controls eased by WPB. (*p. 607*).

Public Housing Authority to dispose of surplus housing (*p. 611*).

Lower Mississippi River levees withstand flood. (*p. 612*).

John L. Savage retires from Bureau of Reclamation (*p. 676*).

Reconstruction needs of Manila listed in report (*p. 681*).

Wm. N. Carey succeeds G. T. Seabury as A.S.C.E. secretary (*p. 733*).

Most Civilian construction permitted to resume by WPB (*p. 747*).

Building Materials scarcity noted (*p. 749*).

JUNE

ARMY ENGINEERS abandon public contract awards (*p. 793*).

ARMY ENGINEERS detail flood-control program for California (*p. 794*).

SECRET PIPELINES under English channel carry gas and oil (*p. 795*).

NATIONWIDE association of engineers proposed. (*p. 798*).

GEORGE T. SEABURY, ASCE secretary, dies (*p. 799*).

NEGOTIATION OF CONTRACTS by Army to be dropped after war (*p. 861*).

CONTRACT SYSTEM changes due to price conditions (*p. 875*).

JULY

HIGHER CONSTRUCTION volume need seen by Secretary of Treasury (*p. 1*).

FWA ADVANCES first postwar planning funds to states and subdivisions (*p. 1*).

ASTM ENLARGES machinery for postwar research work (*p. 10*).

WORLD'S largest produce market planned for N. Y. City. (*p. 12*).

MILLERTON LAKE behind Friant Dam reaches crest (*p. 17*).

STREAM POLLUTION abatement strengthened in N. C., Wash., and Penna. (*p. 17*)

INTERIOR DEPARTMENT starts planning for Missouri River basin development (*p. 60*).

SPECIAL SENATE committee told Inter-American Highway cost 4 times the original estimate of $14,714,200 (*p. 71*).

WESLEY W. HORNER, St. Louis, Mo. nominated for ASCE president (*p. 86*).

AUGUST

EMPIRE STATE BUILDING intact after being hit by bomber (*p. 129*).

FOURTEEN U. S.-built fixed bridges cross Rhine. (*p. 132*).

DEPARTMENT OF COMMERCE estimates war's end will bring construction of $6 billion by industry and railroads (*p. 145*).

ENGINEERS SHARE credit for Atomic Bomb. They built many large plants (*p. 145*).

HUGE PUBLIC WORKS program readied as government gears for peace (*p. 196*).

WPB lifts all controls on industrial contruction (*p. 213*).

BUILDING MATERIAL SUPPLY may be adequate, WPB survey shows. (*p. 259*).

FAIL TO FIX responsibility for Cleveland gas fire (*p. 269*).

SEPTEMBER

WPB eliminates controls on highway building, including bridge construction (*p. 275*).

EQUIPMENT PRICES up 11 percent from 1939 according to Bureau of Labor statistics estimates (*p. 277*).

TRUMAN ASKS release of postwar construction funds (*p. 335*).

MUCH MILITARY construction machinery to be available as surplus. (*p. 338*).

LT. GEN. R. A. WHEELER nominated as Chief of Engineers (*p. 337*).

NAVY REVEALS battleship-sized floating drydocks (*p. 341*).

WPB lifts transportation construction and rebuilding controls (*p. 344*).

PRIVATE BUILDING upswing promises record year (*p. 351*).

THREE HUGE BLIMP HANGARS destroyed in Florida hurricane (*p. 353*).

BRITISH CANCEL U. S. prefabricated house orders (*p. 355*).

REJECT BIDS on Merriman Dam in N. Y. as too high (*p. 356*).

ATOM BOMB ruined Nagasaki by pressure, superheat (*p. 397*).

CHICAGO opens $24 million South District filtration plant (*p. 403*).

OCTOBER

PENNSYLVANIA offers aid for municipal and industrial waste plants (*p. 417*).

FEDERAL HIGHWAY AID money now available to states (*p. 463*).

LABOR COST, materials scarcity balk road work (*p. 465*).

TO RESUME building Chicago River bridge halted by the war (*p. 468*).

TRUMAN ASKS CONGRESS action on St. Lawrence seaway (*p. 468*).

TVA'S KENTUCKY DAM dedicated (*p. 479*).

STATES REJECT rising unit bid prices (*p. 481*).

SENATE COMMITTEE on irrigation and reclamation reports unfavorably on proposed MVA project (*p. 552*).

NOVEMBER

INVENTORY control placed on lumber by the War Production Board (*p. 563*).

NEW ENGLAND STATES unite to control Connecticut River development (*p. 565*).

GOVERNMENT AGENCIES move to aid housing. Six-point program offered (*p. 621*).

MEXICO CITY interests building $10 million sports city (*p. 632*).

CURTAILMENT of public works seen needed by APWA (*p. 639*).

ADM. J. J. MANNING becomes head of Bureau Yards & Docks (*p. 641*).

MAJOR SOUTH AMERICAN road plans described (*p. 687*).

N. Y. CITY ready to start $285 million highway work (*p. 705*).

DECEMBER

ENTIRE length of Rhine River cleared for barge traffic (*p. 751*).

ONTARIO plans $50 million hydro plant on the upper Ottawa River (*p. 757*).

NEW YORK STATE PUBLIC WORKS will not compete with private construction for labor and materials (*p. 769*).

RECLAMATION BUREAU engineers to aid huge China power, irrigation, project. Yangtse River project to irrigate 10 million acres (*p. 771*).

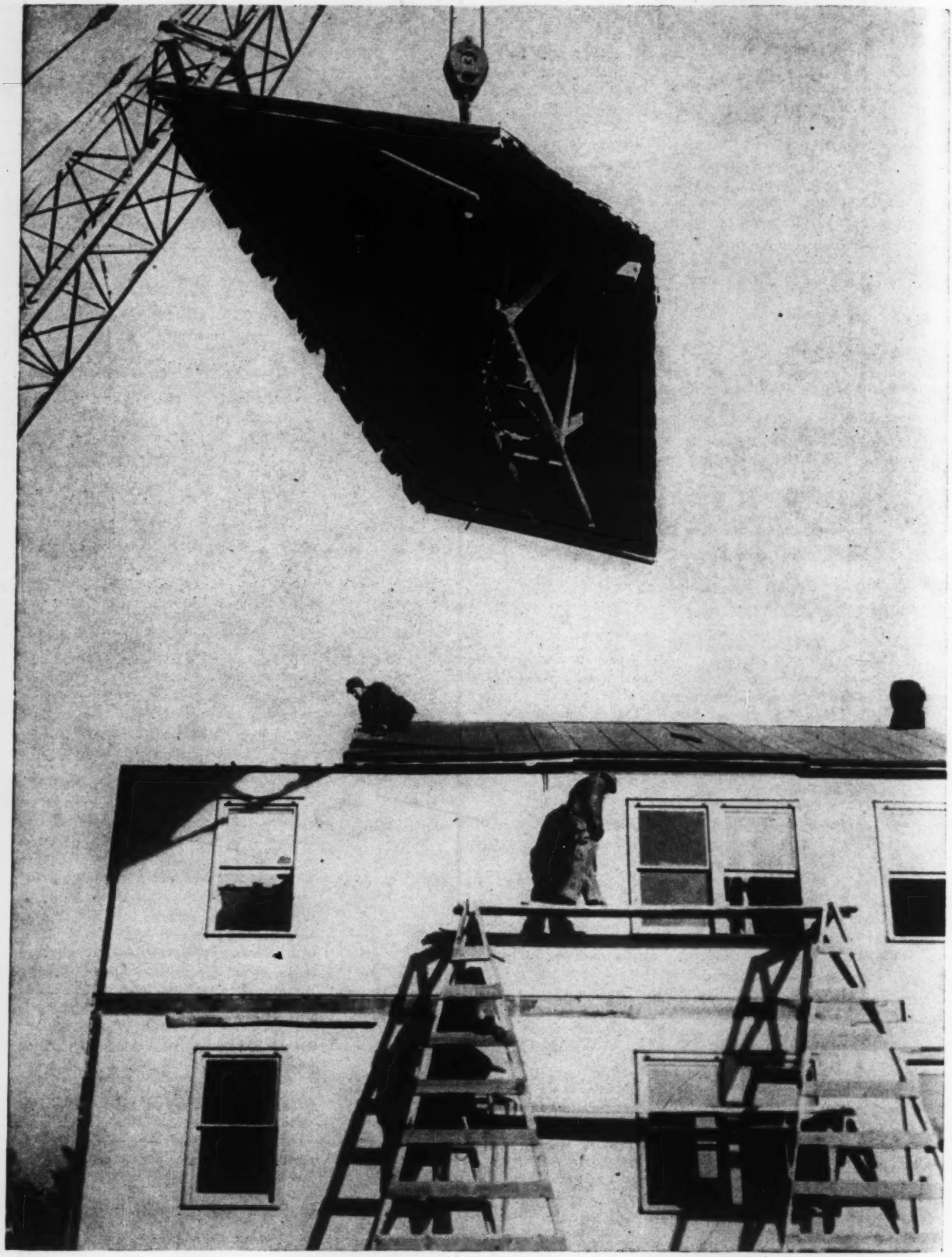
STATES REPORT shortages blocking building program (*p. 773*).

ILLINOIS superhighway act ruled valid by the state supreme court (*p. 773*).

HOME CONSTRUCTION placed under priority control. (*p. 831*).

MEXICO announces $46 million 1946 building program (*p. 845*).

FIRST DEFICIENCY BILL passed, contains $618 million for construction. Veterans Administration to award $350 million of work in 1946 (*p. 849*).



Housebuilding will have to be accorded top priority in the construction program of 1946, which will require the dismantling and re-erection of war housing, as shown here, as well as the building of upwards of a half million new residence units.

SURVEY AND FORECAST—1945-1946

THE YEAR OF VICTORY was one of extremes and contrasts in civil engineering and construction. Still at war during the first eight months, we chalked up in that period some of our greatest military engineering achievements abroad, while at home the flexibility and great capacity of the construction industry permitted war facilities and those destined for peace to go ahead side by side. Despite its headaches, 1945 was a year of accomplishment.

Far-flung Simultaneous Achievements

DURING 1945, Americans in Germany bridged the Rhine in as little as six days, when their colleagues in the United States were embarking upon an industrial building program for peacetime purposes that was destined to add up to more contract volume than in any year in history. In the Marianas and on Okinawa, Navy Seabees and Army Engineers fashioned airbase and supply facilities that set new records of concentrated magnitude at the same time that the largest and fastest coordinated construction project in history was being completed at the Clinton, Tenn., and Hanford, Ore., atom bomb factories.

Such extremes, moreover, were common rather than exceptional. In Cherbourg, LeHavre and Marseille on one side of the world and in Manila on the other, devastated ports were rehabilitated, while in contrast American engineers and contractors were bidding and getting peacetime harbor improvement jobs in South America. Wrecked bridges were cleared from the Albert Canal in Belgium, but in the United States a new bridge was also begun over the Mississippi River at Memphis as others were completed over the Pecos in Texas and the Colorado in Arizona. And while the longest military pipeline in the world, from Calcutta, India to Kunming, China, was being finished by Army Engineers, civilian contractors were resuming work on the Battery vehicular tunnel at New York, shut down early in the war. Month by month the construction accomplishments piled up.

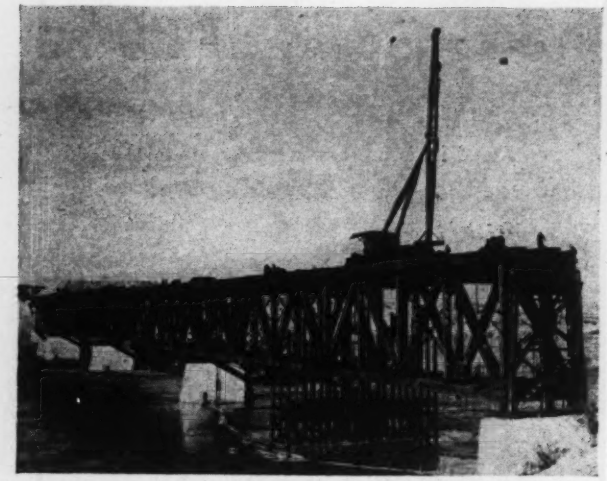
Nor was planning neglected for the dreamed-of future when the military engineers would need peacetime jobs. Congress passed a road bill providing $500 million for highways, it set aside $17.5 million federal aid for planning community facilities and made progress on bills that would furnish $500 million or more for a great national system of airports. Other millions were appropriated for the Corps of Engineers river and harbor work, for Bureau of Reclamation dams and for Veterans Administration hospitals. Many states enacted urban redevelopment and housing legislation to pave the way for both private and public residence construction. And so the record went. 1945 was not simply the year of victory. In it we also took our first steps to implement the hopes and aspirations for the new world for which we fought.

Transition Confusion

IT IS ONE THING, however, to emphasize the highlights, and quite another to place accomplishments in true perspective surrounded by their difficulties and disappointments. Moreover, looking backward at achievement in this light, always sobers the attitude of responsibility for the future. Thus it is that every step taken to shift from a war to a peacetime basis in construction has had to surmount obstruction and to gamble with uncertainties. Transition confusion was and remains immense. And if reason suggests that this is natural and not unexpected, it also points up the tremendous responsibility for eliminating the causes of confusion, and as quickly as possible.

With commendable speed, the WPB first relaxed and then abolished order L-41, the priority control on construction. Anyone could build anything he wished after Oct. 15, if he could find someone to sell him the materials and equipment. These being in short supply, however, heavy bidding for them would have inflated their costs, so wartime price ceilings were rigidly maintained. But the ceilings, in many cases, eliminated profit margins, so that stepped-up production was discouraged. Aggravating the situation, demands for increased wages gave prospects of increased production costs. The net result was an impasse in material supply, only minutely affected by piecemeal upward adjustment of some of the ceilings by the Office of Price Administration.

Confusion was also manifest in contract letting. Uncertain as to availability of materials when



The Santa Fe Railway bridge at Topock, Ariz., placed in operation last Mar. 7, has the deepest pier ever constructed by the pneumatic caisson method. It is founded 123 ft. below water level.

needed, and faced with the demands of union labor for new contracts that would maintain wartime "take home" pay, contractors willing to gamble had to bid high enough to cover these contingencies, and thus often so high that their offers were rejected. At the year end, two main questions were still unresolved: Would removing price controls stimulate the production of materials and do so sufficiently fast to avoid disastrous inflation? And would the same action, accompanied by free collective bargaining, settle wage rate controversies quickly and at a reasonable enough level to encourage and not deter construction investment?

On top of these confusions as to whether construction of any kind could go ahead came the realization of a housing shortage so serious as to cause earmarking of fifty percent of all available materials for that type of work. A new incentive to reduce the transition confusion in the construction industry was at hand.

This Survey and Forecast

THIS ANNUAL SURVEY AND FORECAST of *Engineering News-Record* has been planned to give as much aid as possible to the formation of a proper perspective of construction accomplishment and prospect. Both domestic and foreign fields are covered, the latter to emphasize, by specific examples, the tremendous worldwide rebuilding job that is required rather than to suggest how it is to be done or to imply that the American construction industry can be much of a factor in doing it. In 1946, U. S. engineers and construction men will play a part in some of the South and Central American countries, but can expect to make little if any contribution either in Europe or Asia. Domestically, the editorial reviews of the various divisions of engineering and construction, an article on construction labor and the statistical summary of contracts and costs reveal difficult problems, but also raise hopes high for the future. The total of construction contracts for heavy construction reported in *Engineering News-Record* in 1945 was $2,289,408,000, an increase of one-third over the previous year. A further fifty percent increase in 1946 seems readily obtainable, particularly in view of the huge backlog of projects that accumulated in the war years. The need and desire for these projects are too great to be denied. Under such pressure, some way surely will be found to eliminate the man-made confusions that now bulk so large.

Those Postwar Blueprints

TWO YEARS AGO, when hardly a line had been drawn on plans for postwar construction projects, a campaign for initiating action got underway. Probably no campaign ever had more inertia to overcome or more substantial reasons for support than that devoted to the philosophy of preparing blueprints in advance of need. How thoroughly acceptable this philosophy now has become is probably as gratifying to its early exponents as it should be confounding to those prophets of gloom who saw this ideal as receiving nothing more than lip service. The continuing inventory maintained by *Engineering News-Record* shows that at the end of the year there was an identified backlog of $28 billions of proposed projects of which almost half are estimated to be in the blueprint stage. And despite the handicaps to getting construction started, an additional half-billion dollars of work was put underway in the three months following V-J Day. If any doubts existed a year ago (when some $6 billions of projects were in various stages of planning) that we were illy-prepared with postwar blueprints, those misgivings must be completely dispelled now. The future outlook for a substantial and continuing volume of construction was never more heartening.

Construction Industry Stabilization

With more work on the books now than it can adequately handle for a few years to come, the construction industry cannot overlook the fact that it has always been subject to famines following the feasts. What to do about the seasonal and cyclical

demands that are made upon it has been the subject of vigorous and beneficial discussion during the past year. Perhaps the most provocative suggestions were made by Beardsley Ruml, author of the "pay-as-you-go" plan for income taxes (*ENR* April 19, 1945, vol. p. 590). Among other things he called for a Congressional investigation of the industry, the recommendations from which would lead to establishment of a federal commission to regulate restrictive practices. In Mr. Ruml's own words, this suggestion "had a mixed and indifferent reception by the industry."

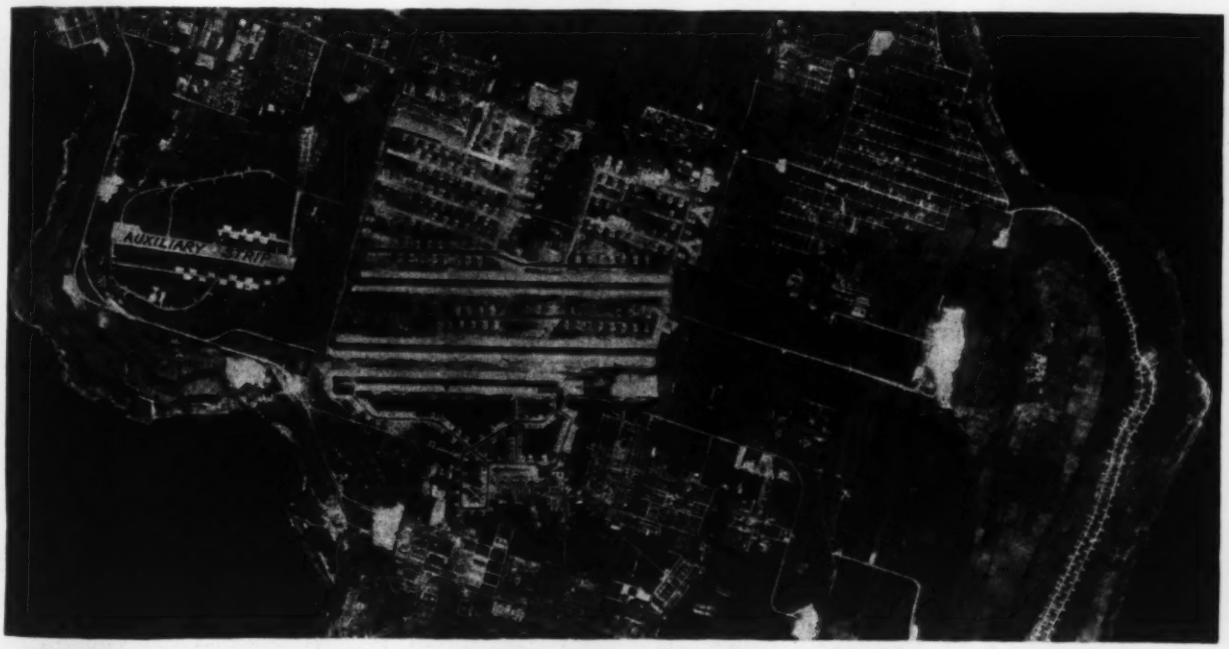
From another direction, Miles L. Colean in analyzing stabilization objectives and principles in a report issued by the National Planning Association, called for: (1) establishment in an appropriate federal government agency of a Bureau of Construction Economics to assemble, maintain and publish essential statistics; (2) creation of a central body, patterned after the National Advisory Committee for Aeronautics, to carry out technical and industrial research; and (3) consideration of measures whereby the federal government would prepare a reserve shelf of its public works projects, provide loans to local governments for advance planning and coordinate the construction timing of such projects.

Two of these recommendations have reached some degree of realization. A construction division has been established in the Department of Commerce to compile and periodically publish all data pertaining to the industry. And Congress has appropriated funds to stimulate local works planning.

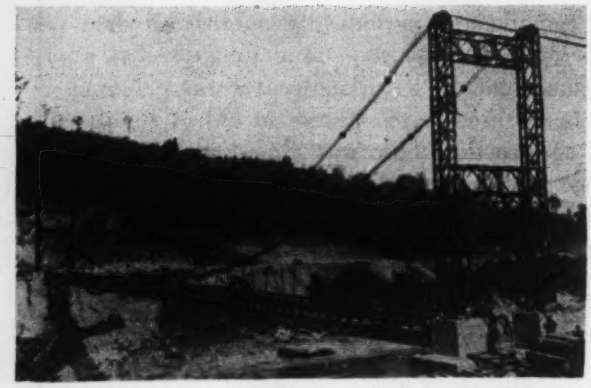
In addition to these steps in aid of stabilization of construction there was almost universal acceptance of the concept that all levels of government should provide a reserve shelf of engineering plans for execution as needed. Although it is not at all clear as to how or by whom this determination of need will be made, everyone seems to be in agreement that a forced program of public works is not needed now to keep the construction industry going.

Materials a Present Bottleneck

DESPITE the recognized importance of finding solutions to these broad questions of forward planning and industry stabilization, however, the pressing problem was and is to get work underway, and here a shortage of materials presents a bottleneck. Building materials are the most difficult to obtain, and included among the critical items are structural clay tile, brick, cast-iron soil pipe, lumber and perhaps steel sheet and structural shapes. Higher wages may boost production of tile, brick and lumber, but pipe manufacture, involving hot and dirty work, does not attract labor regardless of wages. Lumber will be green, with improvement in quality being disappointingly slow. Structural plywood was difficult to obtain in 1945, and will continue to be one of the shortest of the lumber items.



Tops among construction achievements in the Pacific in 1945 were the tremendous B-29 airfield installations in the Marianas by the Seabees and the Army Engineers. This is West Field on Tinian Island.



Longest single span military bridge of the war was this U. S.-built 420-ft. Bailey suspension crossing of the Shweli River on the Stilwell Highway near the China-Burma border.

With the exception of lumber and possibly steel shapes, however, materials needed for heavy construction, as well as for highways and airports, should be adequately available. There is ample portland cement despite restrictions on use of manpower through 1945, which curtailed building up inventories. The new federal materials control, designed to channel 50 percent of all building materials into living units for veterans, is not expected to affect appreciably the volume of heavy construction that will get under way in 1946.

Labor Adjusts to Peace

ADDED TO THE DIFFICULTIES of obtaining materials, construction contractors have had to contend with labor uncertainties following the slow-down of war activity after V-E Day. Many workers wanted a vacation after the long war grind, some taking advantage of lax unemployment insurance laws to prolong their layoffs unduly, and there was a unanimous demand for raised wage rates to maintain on a straight-time basis the inflated take-home pay from war work. A shortage of workers and high labor costs plagued bidders, and both factors will continue to be troublesome during 1946.

It is conceded that labor of a sort will be generally available to meet all construction needs, but there will be serious deficiencies in spots, both geographically and by trades. Moreover, productivity of individual laborers is not up to 1939-41 standards, and there is little chance of improvement until men need jobs and the unemployment compensation that can be claimed has been exhausted.

Building trades labor leaders and public officials are more optimistic about both the supply and productivity of labor than are employers, although construction outfits working only relatively small forces, with a nucleus of long-time employees, have had better results than the larger companies. Good skilled workers will be short in many trades, as few apprentices have been trained in recent years. A detailed discussion of the labor situation in our first peacetime year is given on p. 123.

Equipment Production Lagging

AND as if materials shortages and labor uncertainties were not enough to keep contractors worrying over the future, new construction equipment has reached the market only in dribbles instead of in the steady flow necessary to get the construction program rolling in high gear. While orders on manufacturers' books totaled up to a year's normal production, output was strangled by labor troubles in the closing months of the year. Strikes not only affected many main plants but further curtailed production by shutting off the supply of component parts. During the war the construction equipment industry demonstrated its ability to expand threefold to meet military requirements. This capacity still remains, and if left unfettered the industry could probably catch up with the demand late this year. In the meantime, construction will have to proceed with what equipment is now on hand. As long as construction is also hampered by lack of materials the equipment supply will be adequate. But full-scale construction will not be possible until more new equipment is available.

Equipment Surplus a Myth

AS IT NOW DEVELOPS, it is too bad that the fears of a year ago that military-released used equipment would glut the market after the war have not at least partly materialized, for the construction industry could use the equipment today. Under the army and navy plan of rehabilitating all worthwhile items and shipping them to both theaters of war, there was never much good equipment released here. Then, too, disposal of surplus equipment was kicked around from Treasury to Commerce to RFC, and further was handicapped by various interpretations of provisions of the Surplus Property Act and by frequent changes in sales procedure. Such used equipment as did move was snapped up by governmental agencies and veterans who have priorities under the act, so that very little got through to the distributors for subsequent placement on the job. There is, of course, a vast amount of new and

rehabilitated first-class equipment overseas, but considering the need for shipping to get high-point veterans home the equipment could not be brought back before home factories will be producing at a rate sufficient to meet demands; to return it after that would cause more disruption in employment and distribution than it would be worth. The simple fact is that there is no surplus used equipment and that the early stories that it would glut the market have proved to be myths.

The Housing Crisis

THE COMING YEAR finds the United States faced with the greatest housing shortage in the nation's history. A million families already are living "doubled up". By the end of 1946—unless relief greater than that now in sight is forthcoming—the figure is expected to skyrocket to 3.5 million. The National Housing Agency estimates that 12,600,000 urban units (house, apartment or flat) and between 2 and 3 million farm units, have to be built in the next ten years in order to give America enough housing for its population.

Despite the desperate nature of the situation, nothing very substantial currently is being done—and it is estimated that in view of the shortage of men and material less than 500,000 urban residential units can be provided in 1946. Moreover, it will be at least three years before building is in full swing, and five years before homes will be available in all communities.

Legislative steps—and not too many of them—are the only accomplishments thus far toward solving the problem. Most tangible action, to date, was that of the Civilian Production Administration, which placed priorities on ten general classes of construction materials to assure that an adequate supply be made available for housing for veterans costing less than $10,000, this maximum figure being rather widely criticized as too high. At almost the same time that the CPA announced its program, Congress passed a deficiency bill providing $191,900,000 for dismantling and re-erecting at new sites about 100,000 temporary war housing units. This work already has been started by the National Housing Agency and it is expected that during the first three months of 1946 contracts will be awarded for most of the projects.

While many builders thought they had the answer to the housing shortage in prefabricated construction, very few houses of this type reached the market in 1945. Department stores, alive to the sales possibilities, have started to merchandise the prefabs. Still standing in the way of extensive use of prefabrication, however, are building code restrictions in many places and the relatively high cost of prefabricated houses assembled on the site. Cost reduction through prefabrication has proved to be a myth to date.

In Washington, where the housing shortage is being given intensive study, there have been several suggestions that the country's heavy construction contractors turn to building houses on a mass-production basis. Firms that could turn from dam building to ship building and from road building to cantonment and munition factories during the war might find no great obstacles in adapting their skills to housebuilding.

In so far as legislative action is concerned, the Wagner-Ellender-Taft bill (S.1592) is a measure receiving frequent mention, and the Senate hearings have already been completed. This bill deals with financing, research, slum clearance, disposal of war housing projects, and makes permanent the National Housing Agency. The bill provides $25,000,000 over a five-year period to match the funds of local agencies for research and planning, and makes available up to $500,000,000 for five-year loans to local communities for acquiring slum areas for development. Assistance for slum area construction amounting to $88,000,000 yearly at the end of four years is also provided, as are long-range loans at low interest rates to individuals.

Hearings have also been started on the Patman bill (H.R.4761) planned primarily to provide defense against inflation by establishing ceiling prices

Army Engineers completed an 878-ft. reinforced concrete facing wall last spring along the south bank of the upstream approach to the MacArthur Lock at Sault Ste. Marie, Mich.

on the sale of both new and old housing. But it will require more than legislation to solve the problem. As long as the shortage in materials and skilled manpower continues, the situation will remain critical.

Building Growth and Prospects

THOSE PROPHETS who saw in our tremendous industrial expansion during the war years a filling of the needs of peacetime factory building miscalculated badly, for private industrial building construction in 1945 hit a record high of $635,170,000. Moreover, there is a backlog of $1,331,000,000 in proposed industrial construction available for future contracts, so that continuing high activity in this field is probable in 1946.

Trends in industrial building design so far have not departed from those in evidence during the war years. Nor did wartime buildings introduce much that is new, as witness, for example, the hundreds of thousands of square feet of floor space in the atomic bomb project that were covered with conventional structures. One-story buildings covering large areas and erected away from centers of high population predominate on current works. Also, emphasis continues to be placed on flexibility of floor plans through the use of long span construction and movable partitions.

Wartime shortages stressed economy of materials, and as a result, structural designers endeavored to take advantage of continuity at every opportunity. And, with the increasing demand for larger clear floor areas and clear heights, further use of rigid frames of steel, concrete or timber may be expected. Design of continuous steel members, as well as other favorable factors, such as the large pool of skilled workmen trained in the shipbuilding industry, may result in greater use of field welding. Wartime practices have already given shop welding a considerable impetus.

In the field of building materials, headway was made during 1945 in modular coordination of building products, this standardization of sizes being applied to both steel and wood windows, to concrete block and to structural clay units. Fluorescent lighting and air conditioning gained in popularity, but the trend with respect to a corollary condition seems uncertain—while some windowless buildings are being specified, most industrial structures provide glassed openings, even if only for psychological reasons. Architect's renderings of other classes of proposed buildings indicate very liberal use of glass. There is no evidence as yet to support the popular hope that the end of the war would witness the introduction of a large number of new building materials and products. Structures designed with familiar items, therefore, are in no danger of becoming obsolete in any reasonable number of years.

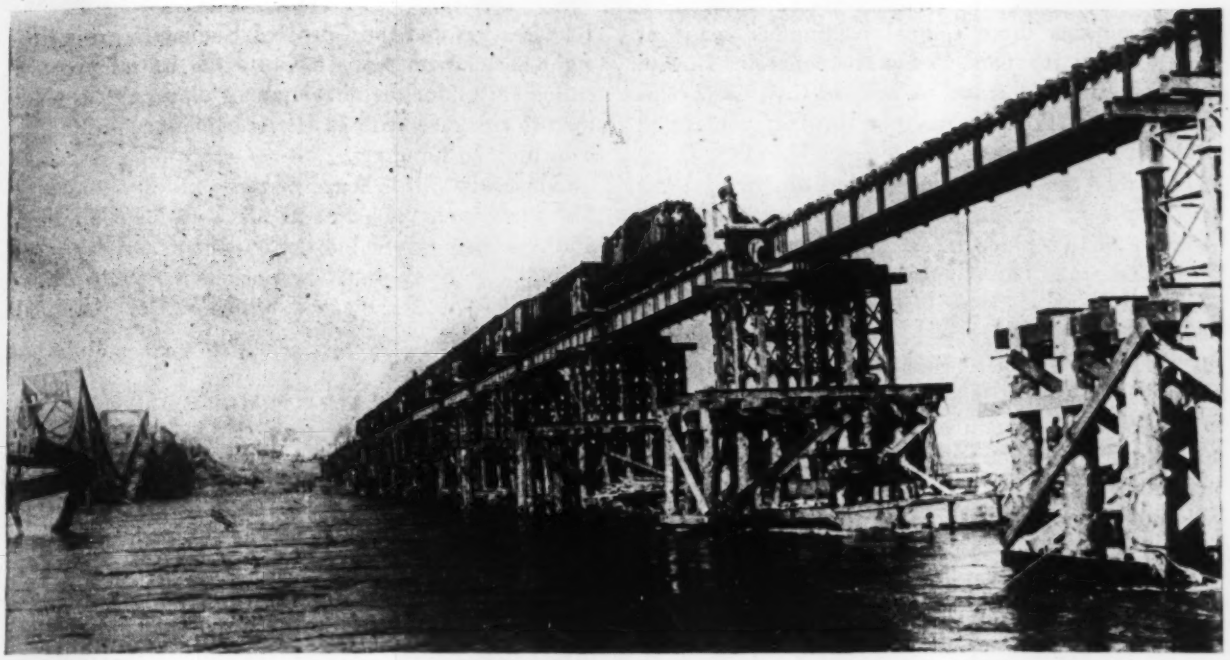
One development that may affect certain types of buildings is the greater availability of light-gage steel, whose use should also be promoted by adoption in the near future of a specification covering the metal itself, as well as design standards for the use of sheet and shapes. Pioneer building now under way of structures utilizing thin, precast reinforced concrete members may also demonstrate that this type of construction is to be reckoned with.

In so far as structural design is concerned, there is to be noted a growing interest in the use of bolts instead of rivets and a reopening of the question of liberalization of reinforced concrete design practices. There is no let-up on talk with respect to building code revision, and the movement to attain uniformity through establishment of state codes gained momentum in 1946. Going even farther in this direction, the American Standards Association and the Building Officials Conference of America are interesting themselves in the promulgation of a national standard that could be used locally as a guide, much as was the intent of the earlier standard code of the U. S. Department of Commerce, and perhaps following some of the precedents set in the West by the Pacific Coast Building Officials Conference.

Upswing in Bridge Construction

DESPITE SHORTAGES of materials, equipment and manpower, particularly during the first half of the year, bridge construction took a decided upswing during 1945. And all indications point to a bridge building program this year considerably in excess of that during the last peacetime year of 1941. Total bridge construction—railway and highway—placed under contract last year amounted to $53,000,000. This was about equal to the 1942 program, and nearly 3½ times that of 1944. In the highway field $23,000,000 worth of bridges were placed under contract during 1945, while nearly $90,000,000 worth of this work is expected to be contracted this year.

Several factors contributed to the increased program in 1945. Relaxation of WPB controls on highway construction early in September was the signal for speedy resumption of bridge construction to replace structures sadly neglected during the war and in a serious state of disrepair. Uncertainty of labor conditions and materials prices resulting in



Most notable military engineering accomplishment in the European Theatre during 1945 was the bridging of the Rhine with a half-dozen semi-permanent railroad structures, each of over 2,000 ft. total length and built in from 5 to 10 days. The crossing pictured above is at Wesel and utilizes spans of rolled beams a meter in depth.

wide discrepancies between contract bid prices and engineers' estimates on several proposed large bridge projects of long duration was not such a vital factor in smaller bridges. Hence, a large number of relatively small bridges was successfully placed under contract during the latter part of last year. Then, too, several large bridges started during the war were brought to final completion, which measurably increased the dollar volume of work executed.

Although the lack of structural steel was a serious impediment to the construction of bridges of that type, reinforcing steel was amply sufficient to permit the construction of reinforced concrete bridges and concrete substructures for some of the larger steel bridges. A notable example of this is the four-lane, 3,695-ft. highway bridge over the Mississippi River at Memphis, Tenn., on which a $4,333,000 contract was awarded last September for construction of the concrete substructure. Bids received two months later on the structural steel superstructure were rejected as being about 20 percent too high.

The scarcity of form lumber also had a marked effect on bridge design during 1945. As a result one county in Ohio developed plans for building small bridge abutments entirely with precast concrete blocks, using no forms whatsoever. At Canton, Ohio, a two-span arch bridge was built entirely of vitrified paving brick in an effort to avoid the use of more critical materials. No steel was used and only a small amount of timber was needed as centering for the arches. The bridge carries a 40-ft. roadway and two sidewalks. Arches are 28-ft. clear span and 9-ft. rise.

Some Notable Bridges

OUTSTANDING among the larger bridges of 1945 was the Atchison, Topeka and Santa Fe Railway double-track crossing of the Colorado River near Topock, Ariz., which was placed in service last April. Some 1,500 ft. long, of deck truss and girder type, the bridge contains one of the deepest pneumatic piers ever constructed in this country. The pier extends 123 ft. below water level and it was necessary to obtain special permission from the Arizona Industrial Accident Commission to use the necessary air pressure of 52 psi.

Going to the other extreme, the Southern Pacific Railway bridge over the Pecos River in Texas has hollow concrete piers, the tallest of which rises 275 ft. from the bottom of the gorge. A single-track, continuous deck cantilever structure of a total length of 1,390 ft, it was designed against earthquake forces as well as substantial wind pressures. The Georgia State Highway Department last year built its longest (701 ft.) continuous reinforced concrete girder bridge over the Chattahoochee River, near Atlanta,

which contains three central continuous spans at 60—90—65 ft., flanked by six concrete T-beam spans on each side; and at Kansas City the 2,625-ft. Harry S. Truman railroad bridge, containing a 420-ft. lift span was dedicated.

Probably the outstanding bridge design of 1945 was that for a new Tacoma Narrows crossing in Washington to replace the one that collapsed in 1940. The new designs, based on results of a four-year wind tunnel study on a 100-ft. long scale model, provides a bridge about 50 percent heavier than its predecessor, one that will use 33-ft. deep stiffening trusses instead of the 8-ft. plate girder stiffening members in the original structure, and one in which floor-beams will be of open truss design and in which open steel floor gratings will be used to separate the four 9-ft. traffic lanes.

Water Compacts

MANY YEARS OF EFFORT directed toward finding an acceptable apportionment of the waters of three rivers in which this country and Mexico each have an interest came to a successful conclusion in 1945 with the signing of a water treaty relating to the Rio Grande, Colorado and Tijuana rivers. In addition to fixing the amounts of water that can be used by each country, the treaty provides for construction of three large dams on the international section of the Rio Grande and for the construction of a Mexican diversion dam along or below the international section of the Colorado within five years. Also called for is construction of Davis Dam on the Colorado within the same period. Construction of this dam was started in 1942 but was stopped by the war. Work has been resumed.

During the year, Congress gave its consent to plans of the states of Colorado and Kansas to enter into a compact for division of the waters of the Arkansas River, and the U. S. Supreme Court handed down a decision concluding eleven years of litigation regarding apportionment of the natural flow of the North Platte River among the states of Colorado, Wyoming and Nebraska.

River Authorities

BILLS CALLING FOR THE CREATION of a Missouri Valley Authority to take over all flood control, navigation, irrigation and water-power development work in the Missouri River basin appear destined to die a slow death in Congress. Some committee hearings were held on the bills during 1945, but still other committees must consider the bills before they can be reported out. Meanwhile both the Bureau of Reclamation and the Corps of Engineers are going right ahead with plans to build the initial projects called for under the development plan agreed to by the two agencies in 1944 after each had submitted its own plan to Congress.

Some talk still is heard of river valley authorities for other interstate streams such as the Columbia and Arkansas rivers, but the opponents appear to be so much more strongly entrenched than the proponents of such schemes as to make Congressional approval appear highly improbable.

Flood Control to Go Forward

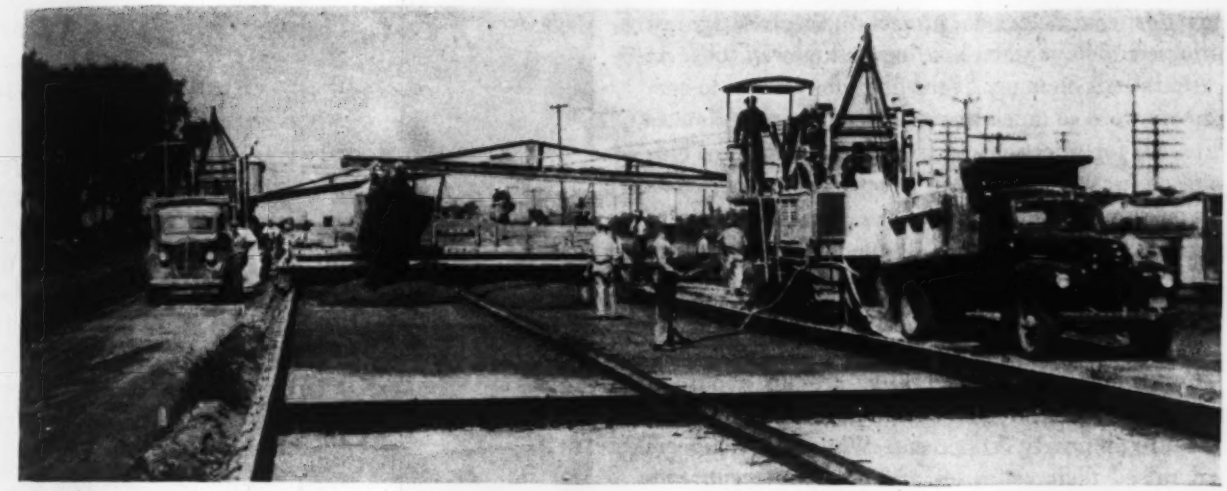
AT LEAST FOUR MAJOR developments pertaining to flood control work occurred during 1945. Late in the year Congress provided the U. S. Army Engineers with $97,000,000 for flood-control projects. This money will permit a huge construction program to be started, including a start on the $130,000,000 Garrison Dam, a key project in the authorized 1½ billion dollar development program for the Missouri River basin.

As the year ended, the Army Engineers had planning completed for about a billion dollars of river, harbor and flood-control construction. Of this amount, more than $800,000,000 is for flood-control projects that can be started quickly. Many of the jobs will go ahead with the money now available, and Congress will soon be requested to make additional appropriations.

In April, a long severe flood on the lower Mississippi resulted in stages above those of the 1937 flood from Baton Rouge to the mouth of the river. At Baton Rouge the stage exceeded by 0.1 ft. the 45.0-ft. stage reached in the 1937 flood and came within 2.7 ft. of the all-time high of 47.8 ft. established in 1927. At New Orleans, the stage averaged 19.6 ft. for several days, which compares with a maximum of 19.3 ft. in 1937 and an all-time high of 21.3 ft. in 1922. However, despite this unusually high water, it was not necessary to place the Morganza Floodway in service because of the effective operation of the Bonnet Carre Spillway above New Orleans. The latter was operated at its full capacity of 250,000 cfs. and held the main river at New Orleans under the 20-ft. stage.

At Gilbertsville, Ky., the TVA dedicated Kentucky Dam, by far the greatest flood-control structure in the Tennessee River system.

Near Clinton, Miss., good progress was made on construction of the 200-acre model of the entire Mississippi River basin, which is to be used for flood-control studies. Representing a drainage area of



Nearly 50 miles of 24-ft. reinforced concrete pavement was placed last year on U. S. Highway 66 between St. Louis and Chicago as part of a program for converting that road into a high-speed divided highway.

1,244,000 square miles and expected to cost $3,000,000, the model will be by far the largest ever built.

Establishment of a New England interstate flood commission was agreed to by the governors of the New England states late in 1945. Its principal function will be that of eliminating differences of opinion between the states as to the location of reservoirs to be built on interstate streams of the region, differences that in the past have delayed flood-control work.

Land Reclamation

THE GREAT EXPANSION of land reclamation work in recent years is shown by the fact that the Bureau of Reclamation now has over $140,000,000 with which to start construction on a program calling for an ultimate expenditure of one and one-half billion dollars. A decade ago, after reclamation work had been stepped up to create employment, a reclamation program totaling $50,000,000 was characterized as huge, the annual pre-depression appropriations having been around $10,000,000.

Largest item in the new program is the Columbia Basin project in eastern Washington, for which Grand Coulee Dam is the source of power and water. Ultimately, it is planned to irrigate over one million acres of land at a cost of $355,000,000. Facilities to be built include the world's largest pumping plant at Grand Coulee Dam, four dams to form storage reservoirs, 4,000 miles of canals and 66 siphons. Landowners have agreed to pay $87,500,000 of the cost over a long period of years; power sales from Grand Coulee are expected to cover the remainder of the federal expenditures.

The first long-time contracts for irrigation water in the Central Valley in California were signed during 1945 by the Southern San Joaquin Municipal Utility District. It covers the delivery of water from the Friant-Kern Canal to lands in the San Joaquin Valley.

As 1945 closed, three costly plans for delivery of Arizona's share of Colorado River water to the irrigable areas in the central part of that state were still under study.

The great interest of foreign countries in land-reclamation practices in this country was demonstrated during the year by visits of more than 170 representatives from 29 foreign countries to projects of the Bureau of Reclamation. Late in the year, China made an advance payment of $250,000 to the bureau on a $500,000 contract for engineering services in connection with an enormous power, irrigation and flood-control scheme proposed for the Yangtze River. About a dozen other countries made requests to the bureau during the year for the loan of experienced engineers.

Roadbuilding Off to a Slow Start

ROADBUILDING was expected to be one of the first postwar construction operations to get under way quickly after the war, and plans to that end had been carefully drawn, including a federal-aid program that would provide $500,000,000 to be matched by states, cities and counties in each of the first three postwar years. But to date progress has been far below the anticipated rate, due to a variety of unforseen conditions.

The basic cause is a scarcity of labor, of most construction materials and construction equipment. Uncertainty as to when any or all of these will become available has been a further contributing factor, because all have combined to make it neces-

sary for contractors to protect themselves against unforseen delays when bidding on highway jobs. As a result, bids on many of the first jobs offered to contractors were so much above the engineers' estimates as to call for rejection. In volume the amount of bids rejected was not high, but the psychological effect was widespread. The difference between estimates and bids, however, was not all due to contractors putting a cushion in their bids; in several states it was due to failure of the engineers to recognize fully the upward trend of prices since the prewar days.

Construction costs, generally, are up about 30 percent over prewar, and some elements of highway costs are up nearly 50 percent. Where the engineers had raised their estimates around 30 percent, contractors bids seldom were more than 10 or 15 percent above their figures except on jobs involving some peculiar difficulties. In states where still higher allowallowances had been made, some bids were under the estimates.

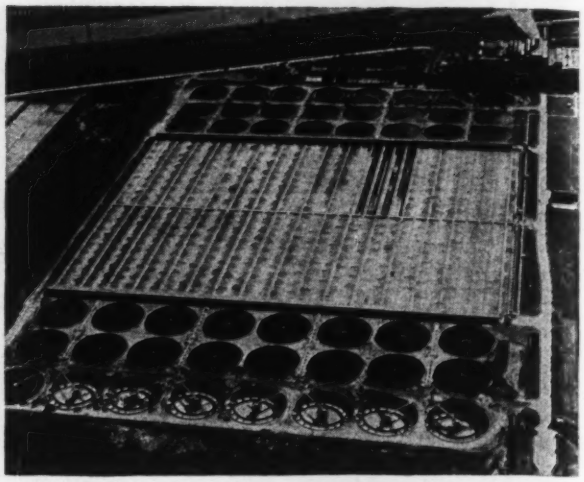
Another condition that slowed up the start of roadbuilding was lack of adequate engineering staffs in most state highway departments, a condition that put a check on advance planning during the war years.

As the year 1945 closed it was becoming apparent that roadbuilding along with other public work is going to be in competition with private work, a condition that is certain to raise construction costs. In consequence of this, some states are planning to limit their new work to badly needed construction or replacement, putting off their more ambitious undertakings until they feel conditions have improved.

Highway Program Expanded

CONGRESS, on Oct. 2, 1945, declared the war emergency sufficiently relieved to permit the great postwar highway program authored in 1944 to be inaugurated. This action not only made available $225,000,000 for work on the federal-aid highway system during the fiscal year ending July 1, 1946, but also authorized expenditure of $150,000,000 for work on secondary roads and $125,000,000 for highways through cities. Financial aid for these two latter operations is a new departure for the federal government and places new responsibilities in the state highway departments.

It now appears probable that starts will be made on quite a number of superhighways into and through large centers of population, plans for which were prepared during the war years. The start of this work, however, will be slow due to the difficulties involved in acquiring land and clearing old buildings from the sites. Also, on some projects requiring the demolition of houses, the land clearing must wait until the housing situation improves.



Chicago's Southwest sewage treatment plant, held up 4 yr. by the lack of necessary control valves and sluice gates, was finally completed in 1945 on a contract which included sixteen additional 126-ft. dia. settling tanks and six 70 x 47-ft. sludge concentration tanks. Although its capacity of 500 mgd. makes it the largest activated sludge treatment plant in the world, serving 1,500,000 persons and treating industrial wastes with a population equivalent of nearly 2,200,000, plans are under way to increase its normal capacity to 900 mgd.

More Traffic Congestion

REMOVAL OF WAR RESTRICTIONS on gasoline use served to re-emphasize the fact that congestion on our city streets is the greatest transportation problem of today and one for which no economically justifiable solution is in sight. Also, it appears obvious that once the automobile manufacturers get back into production, conditions in some cities will become so intolerable as to serve as a serious check on business. Provisions for off-street parking of cars, which is widely recognized as a palliative if not a complete solution, is being widely discussed but little is done about it due to the high cost of providing areas of adequate capacity in most cities.

Air Transport Facilities

ANOTHER TRANSPORT PROBLEM that is developing into a serious drain on municipal budgets is that of providing airports adequate for modern air transport planes and for the rapidly growing air traffic. Airports that were considered to be the acme of air teminals in the years before the war now are wholly inadequate for the demands placed on them. New York's LaGuardia Field, completed about five years ago at a cost of $40,000,000, is the outstanding example. Today the city is pushing work on the

initial stage of Idlewild Airport, at a cost of $27,000,000, to relieve the congestion at LaGuardia Field. The second stage, due to be completed in 1949 will bring the cost to the city up to $76,000,000, which figure is exclusive of expenditures by the air transport lines for privately owned facilities.

Bills authorizing federal aid to cities in catching up on air-transport need have been knocking around in Congress since early last year without final action. They call for federal aid to cities on a 50-50 matching basis for construction of 3,050 new airports and improvement of 1,625 existing fields at a total cost of over one billion dollars.

Inland Waterways

MODERNIZATION of one large section of the inland waterway system was practically completed in 1945 with the completion of Kentucky Dam near the mouth of the Tennessee River. Filling of the reservoir behind that dam now make it possible for barges of 9-ft. draft to navigate from the Ohio up the Tennessee to Knoxville, a distance of 648 miles. This gives the Tennessee valley access to the 9-ft. waterways in the Ohio and Mississippi valleys.

The only other waterway to receive attention during 1945 was the St. Lawrence. Development of the power resources of the international section of that river and construction of a modern ship canal to replace the present antiquated canal was recommended to Congress by the President in October, and bills to implement his proposal were placed before both houses of Congress at that time. Also, a joint resolution giving effect to the 1941 agreement with Canada was placed before both houses in the hope of avoiding the delays incident to ratification of a treaty. Congress, however, has taken no action on either the bills or the joint resolution.

Great Falls, Mont., completed this 4,750,000-gal. prestressed reinforced concrete water tank early in 1945. It is notable in that in addition to the customary circumferential bands of prestressed rods it employs vertical prestressed rods to guard against horizontal cracks from temperature and plastic flow.

Water Supply Developments

THE BACKLOG of $874,000,000 of water supply work reported by *Engineering News-Record* at the end of the year makes it apparent why waterworks associations, who aggressively promoted postwar planning, have now decided that such efforts are no longer needed. To fully appreciate how large this volume of proposed work bulks, it is only necessary to recall that the greatest accomplishment in any previous year was $163 million of work put under contract in 1939.

Highlight of the year was the inauguration of partial treatment facilities at the world's largest filtration works at Chicago. Here the 320-mgd. South District plant, whose construction was delayed three years by the war, went into operation to provide sedimentation and chlorination until the filters are completed. The largest supply project put under contract in 1945 was the $17.5 million aqueduct for San Diego; the aqueduct, which will carry 50 mgd., taps the Los Angeles supply system that draws water from distant Colorado River sources.

Relatively little change in water treatment practice occurred during the year, but some interesting speculation was made concerning the possible adaptation of electronic developments (supersonic sound waves). The possibility of either the total elimination or else great reduction in the size of sand filters, as well as application of electronic flocculation, was foreseen. Not overlooked, either, was the powerful disintegrating effect on micro-organisms that can be induced in a liquid subjected to high-frequency sounds.

Waterworks contracts for the year totaled about $61 million, which represented an 83 percent increase over 1944.

Sewage and Industrial Wastes Disposal

REFLECTING PUBLIC DEMAND and the aggressive promotion of state health agencies for stream pollution abatement, municipalities throughout the nation have been preparing a huge program of sewage disposal facilities. With all construction stalemated, however, only some $11.5 million of work was put under way last year, leaving a backlog of $1,550 million of proposed projects; some 80 percent of these have advanced to the planning stage.

Developments in industrial waste treatment during the year were highlighted by knowledge of two processes that may ameliorate certain types of pollu-

tion. One of these relates to the mechanical reaeration of streams subjected to heavy sulphite pulp discharges; the method calls for diffusion of air into a stream as a means of accelerating natural purification processes. The other, a process for descaling metals using sodium hydride, provides a substitute for acid pickling; wastes from the latter are large in volume and constitute one of the major sources of stream pollution in industrial areas. Prospects of more uniform and effective regulation of industrial waste discharges are indicated by the establishment of a number of state commissions. Many of the commissions will engage in the development of standards for streams, preparation of regulatory procedures and further assistance for treatment installations.

Federal activity in respect to nationwide pollution control is currently centered in three bills pending in Congress. There are the Spence, Mundt and Smith bills, of which the Spence bill (H.R. 4070) appears to have the largest measure of support; the latter calls for exercise of national control through the police power of existing state agencies. The other bills, which would invest control in either the U. S. Public Health Service or in a board representing various federal agencies, is believed by many to be the wrong legislative approach to the problem.

Work for Engineers

ENGINEERS did not lack work in 1945. Consultants were busy on a wide variety of projects, and an unusually large number had work in Latin America. Similarly, among engineering employees, there were many more jobs than there were men looking for jobs. This condition promises to continue for many months unless scarcities of construction labor and materials result in a drastic cut in the amount of work let to contract.

The pinch is being felt worst in civil service jobs such as state highway departments and city engineering offices where pay rates are fixed and low. A few highway departments have been able to increase pay rates, but most of them are not so fortunate. Some highway authorities are alarmed lest this condition makes it impossible for the highway department to attract the better grade engineers. Much the same can be said of municipal service.

Educational Problems

THE OPINION IS COMMON among educators that this shortage of engineers is due to failure of the Selective Service to defer engineering students. They set the resulting deficiency at many thousands and hold that it will not be made up for several years. While that view appears exaggerated and slightly colored with wishful thinking, there is no doubt that war casualties and the disruption of the training of potential engineers did contribute to the present shortage.

However, the lower classes in engineering schools are now filled to overflowing, and many applicants are being turned away as a result of the liberal educational grants provided under the G.I. Bill of Rights. This has put the schools in a difficult position. They are shorthanded due to loss of many of their younger teachers to war industries or to the military forces, they lack the financial resources to compete with industry for the services of the able young men who should be added to their staffs, and their laboratories and housing facilities are inadequate for the load being put on them.

A few engineers are beginning to ask what effect this great influx of engineering students is going to have on the engineering profession. Will it produce a great excess of engineers within the next few years? Such a condition appears more probable than the continuing shortage that was being so generally predicted less than a year ago when the engineering schools were almost empty.

Out of the Shipbuilding Business

SHIPBUILDING passed out of the construction picture in 1945 after a spectacular five-year period of intensive building first of shipyards and then of the ships themselves by construction contractors and construction workers. Some ships, a very large number by prewar averages but few compared to the war peak, are now under construction in American yards, but most of these are special types and are being built in the long-established shipyards.

More vessels now are available than are being used, so some ships and many shipyards are available as government surplus. The concrete ships, of which 24 were built, are now all out of service as their heavy weight makes them uneconomical cargo carriers. Structurally they proved sound and dry, working through severe storms without damage. The eighty large concrete barges, which were built, have been taken over by the Army and Navy and are reported as giving good service as floating warehouses, mostly in Pacific waters. Fourteen floating drydocks built of concrete by the Navy's Bureau of Yards and Docks, are in constant use and are dry, stable and show no structural defects after two years in service.

The construction industry's contributions to shipbuilding forms one of the most significant among its many war accomplishments.

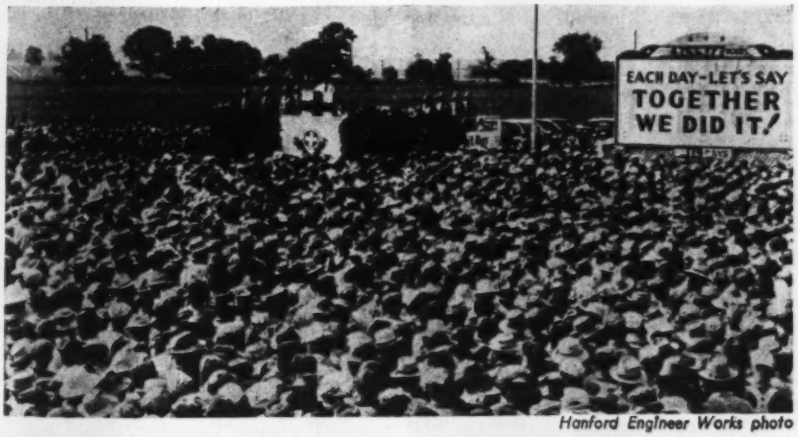
Construction Workers— How Many and at What Wages?

***Contents in Brief**—Construction is one of a few major industries still under wage control of the federal government. Wage increases are being allowed in many cases up to 15 percent over 1941 union rates, but construction workers are not satisfied, due partly to agitation elsewhere for larger increases. Manpower demands of construction will be met numerically except in a few spots—geographically and by trades. Workers cannot be expected to be as productive as prior to the war, and unit costs will be higher due to upgrading and the fact that few can be found who will work at laborer's wages. Apprentice training, especially under the "G.I. Bill of Rights," is expected to add substantially to the number and ability of skilled workers over the next few years.*

WHETHER the construction industry turns out the great volume of postwar housing, buildings, dams and roads that everyone is clamoring for depends to a very great extent on construction labor. It depends upon the number of workers who will offer their services, upon what wages they will work for and perhaps more than anything else upon how willing they are to improve their skills and increase their individual productivity. Right now there is a question mark opposite each of these important questions concerning construction labor. Until dependable answers are found to these questions the future of construction, both its volume and its cost, is bound to remain shrouded in the mists of confusion and uncertainty. Significantly, however, contractors who have had work to do and have done it are less worried about both the present and the future than are those who have not been busy.

Any reference to construction labor today means organized labor because 92 percent of all construction workers are now in unions, according to Department of Labor records. Also, on the question of construction wages, the federal government's rules must be taken into account since it must pass upon all wage contracts that may result in an upward adjustment of prices to the consumer.

To get an accurate picture of the labor situation, therefore, one needs to probe these sources of information and to weigh the results against the opinions and attitudes of employers. It is upon such a framework that the information in this article has been assembled.



Hanford Engineer Works photo

Workers released by war industries are an important source of postwar labor.

There is little doubt but that the immediate moving of construction off of dead center depends upon a satisfactory solution of the wage rate problem. Since the middle of January, some rifts have been appearing in the clouds of uncertainty as some worker-employer agreements have been ratified to stabilize working conditions and wages for at least two years in the future. Once the wage crisis is resolved the longer term factors of increased labor supply, apprentice training, working conditions and the like can be worked out in an atmosphere of employee-employer cooperation with a chance of success.

Substantial wage increases

Skilled and unskilled workers on construction are asking for substantial raises to compensate for the shorter work week with loss of war-engendered overtime and to meet the higher costs of living. Contractors generally are willing to go along on some wage rate increases in the hope that they will bring security from other labor troubles and permit long term agreements so that they can intelligently bid on work to be executed some time in the future without the threat of high increase in labor rates after they have made definite price commitments. But wage controls are still in effect for practically the entire construction industry under the supervision of the National Wage Stabilization Board, which on Jan. 1 took over the authority of the National War Labor Board to pass on all wage agreements that may result in an upward adjustment of prices to consumers.

Under existing conditions, labor throughout the country is asking for substantial raises, which the Stabilization Board is paring down to a maximum total of about 15 percent over January, 1941, union wage rates, deducting any increases previously granted. Throughout the country, average rates specified in union agreements have increased 6 to 8 percent from the effective date of the "Little Steel" formula to V-J day.

In New York City, for example, labor has had no general rate change since 1939. After agreement with employers on stabilized working conditions for five years and wage rates for two years, New York workers recently have been allowed increases approaching 15 percent. Six holidays annually with pay and other provisions were disallowed, leaving the contracts negotiated over 18 months in jeopardy. As a result of a general strike threat for Feb. 1, the Wage Stabilization Board reviewed the agreement, allowed the six holidays and some other provisions permitting completion of working agreements that are mutually satisfactory to employers and employees.

Wages increase more than scales

But throughout the construction industry pay increases have been much greater than is indicated by changes in union wages since 1941. As shown in the table, the average wage rates for bricklayers, carpenters, and ironworkers have increased 15.8 percent and for common labor 33.9 percent. This table is based on average wages paid in 20 representative cities as reported by *ENR* correspondents. These reports are independent of union wage rates but at present, rates generally are identical with the union scale. Much of the increase, especially in the labor classification, reflects increasing union domination of the industry since 1941.

In addition to the current 15 percent increase generally being asked, there is some talk of an additional 10 percent in six months to two years. Labor has made few concessions or guarantees of better production and has no plan for elimination of work stoppages.

Labor has a claim

Responsible heads of the union at the policy making level are not anxious to have runaway increases in wage rates as they fear corresponding deep cuts if and when widespread unemployment occurs. They enthusiastically support the 15 percent increase over January, 1941, but, remembering conditions after former inflation rises when building work was slowed and wages cut, they would be willing to keep wages at that level at least for the immediate future. However, the rank and file of labor as well as business agents who work directly with the men want the 33 percent increase that Economic Stabilization Director John T. Collet said the cost of living had climbed from January, 1941, to September, 1945.

In the opinion of labor, the increased rates are necessary, as take-home pay has been cut by reduction of overtime and by income tax deductions. Prior to the start of withholding income tax from wages, contractors were not required to report employees receiving less than $750 per calendar year. Despite good total incomes, many workers did not earn $750 from a single employer, and hence no tax was paid.

In addition, there is less differential from industrial rates than formerly existed to compensate construction workers for seasonal employment, or for time lost due to inclement weather, the shortage of material or just plain waiting for a place to work, as is frequently the case on building jobs. Naturally, workers do not credit unemployment pay against any of the lost time.

Presumably wage increases affect only work contracted after the date of price rise. Actually it has proven almost impossible to get men to work on lower rate jobs after an increase is granted in the area. Here again the contractor is in a difficult position, for the government, whose approval must be obtained for wage increases, is actively prosecuting cases where wage rates paid exceed the ceiling.

Future control a question

The price and wage controls governing the construction industry now terminate June 30, unless extended by action of the Congress. It is anybody's guess whether the controls will be renewed, but there is some reason to be-

SKILLED AND COMMON WAGE RATES—JAN. 1941 COMPARED TO PRESENT

(Based on tables of labor rates published monthly in *Engineering News-Record*)

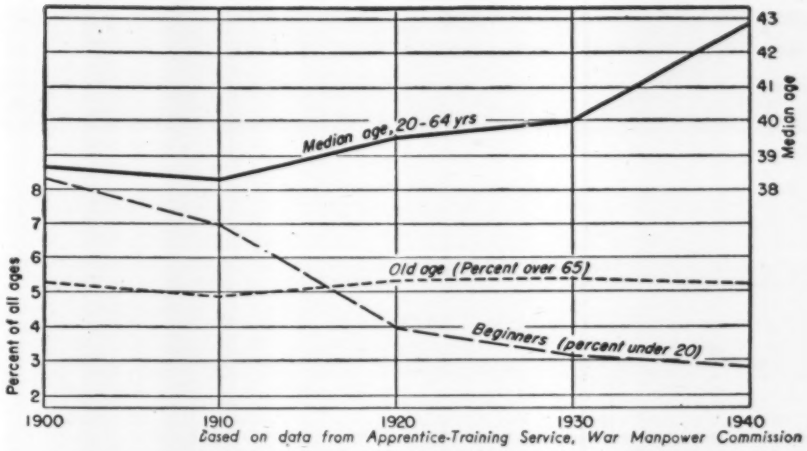
	Bricklayers		Carpenters		Struct. Iron Workers		Hoisting Engineers		Plasterers		Common Labor: Building		Common Labor: Heavy Const.	
	1941	1946	1941	1946	1941	1946	1941	1946	1941	1946	1941	1946	1941	1946
Alanta	$1.25	$1.50	$1.00	$1.25	$1.375	$1.50	$1.00/1.25	$1.25	$1.25	$1.50	$0.40/.50	$0.65	$0.40/.50	$0.65
Baltimore	1.50	1.75	1.25	1.675	1.65	1.90	1.50	1.625/1.80	1.375	1.725	.625	.95	.625	.95
Birmingham	1.50	1.75	1.125	1.375	1.375	1.625	1.125	1.50	1.00	1.65	.40	.65	.40	.65
Boston	1.50	1.725	1.00/1.25	1.60	1.50	1.725	1.625	1.50/1.875	1.625	1.667	.60/85	1.15	.60/.85	1.15
Chicago	1.70	1.90	1.625	1.85	1.70	1.88	1.70	1.85	1.70	1.90	1.025	1.20	1.025	1.20
Cincinnati	1.625	1.825	1.45	1.60	1.55	1.725	1.375/1.525	1.45/1.60	1.625	1.75	.75	.90	.75	.90
Cleveland	1.625	1.875c	1.375	1.65	1.50	1.875	1.50/1.75	1.875	1.625	1.875	.90	1.085	.90	1.125/1.155
Dallas	1.50	1.9375	1.00	1.425	1.25	1.625	1.00	1.625	1.50	1.75	.40/.50	.70	.40/.50	.75/1.25
Denver	1.65b	1.80b	1.43b	1.625	1.43b	1.50b	1.43b	1.625b	1.50b	1.65	.718	1.00	.718b	1.00
Detroit	1.50	1.725	1.25	1.50	1.625	1.825	1.50	1.675/1.825	1.55	1.775	.60/.75	1.00	.60/.775	1.00
Kansas City	1.625	1.75	1.375	1.575	1.50	1.70	1.50	1.70	1.575	1.75	.85	.975	.50	.90
Los Angeles	1.25	1.50	1.10	1.35	1.375	1.625	1.375	1.375	1.50	1.667	.625	1.00	.625	1.00
Minneapolis	1.375	1.625	1.25d	1.50	1.50	1.625	1.40	1.60	1.50e	1.725	.85	.95	.85	.95
New Orleans	1.50	1.625	1.25	1.375	1.375	1.625	1.375	1.55	1.40	1.50	.40	.70	.50	.80
New York	2.00b	2.25b	1.85b	2.10b	2.00	2.55	2.00b	2.25b	2.00c	2.00b	1.031	1.20	.875/.95	1.20
Philadelphia	1.65b	2.00	1.40	1.58	1.65	1.90/2.00	1.50	2.25	1.75	2.00	.70		.70	.90
Pittsburgh	1.75	1.90	1.50	1.75	1.50	1.75	1.25	1.8125	1.75	1.875	.80	1.00	.70	.90
St. Louis	1.50	1.90	1.00/1.50	1.70	1.75	1.90	1.50/2.00	2.20	1.75	1.75	.45/.875	1.00	.875	1.00
San Francisco	1.75c	1.875	1.25	1.50	1.60	1.75	1.50	1.50/1.75	1.60c	1.75	.813	1.00	.813	1.00
Seattle	1.60	1.91	1.25	1.61	1.50	1.81	1.50	1.70	1.60	1.91	.90	1.21	.90	1.21
Montreal	.80	1.06	.70	.96	.75	1.01	.65	1.01	.80	1.06	.45	.61	.40	.66

	1941	1946	Increase	% increase
ENR Skilled Average; (Bricklayers, Carpenters, Ironworkers)	$1.469	$1.714	.232	15.8
ENR Common Average; Building and Heavy Construction	0.711	0.958	.241	33.9

b For a 7-hr. day. c Prevailing rate on government work.

lieve they will be continued until the supply of labor and materials returns to near normal.

It is interesting to speculate on what might happen to construction wage rates if controls were completely removed at a time of general labor unrest, a seller's market and virtually all construction workers organized under the AFL. Would wage rates spiral upwards, followed, or even preceded by employers passing the increase on to buyers? Would the CIO, which now professes no intention to enter the construction field, attempt to break in to change the horizontal AFL setup of labor to a vertical organization that they always have claimed is more economical and would reduce the cost so their members could afford better living conditions? There is no doubt that top construction men among both employers and unions would recognize this as a threat to the industry and as a challenge to further development of means for reducing labor at the site, but leaders might not be able to control speculators and certain workers.



Average age of skilled workers in nine principal construction trades is rapidly increasing. Only half as many young men are attracted (or admitted) to the work as are necessary to replace those over 65. Carpenters are perhaps in the least favorable position with a median age of 46, more than 7 percent over 65 and only 2 percent under 20, according to the 1940 census.

Craftsmen and laborers scarce

Secondary only in immediate importance to the wage question is the problem of supply of construction workers. Expected widespread unemployment has not occurred or has been cushioned by an accumulated reserve of unemployment compensation and savings that workers have preferred to use up before accepting lower pay jobs in reconversion to peacetime. Really skilled craftsmen and laborers are relatively scarce and will continue to be so if the volume of construction said to be necessary for a full peacetime economy is achieved. But despite predictions in 1941 and 1942 that labor was unequal to the job of building for war, the huge volume of necessary construction was completed. The current job undoubtedly will be met as well, once the wage hurdle is passed.

It is expected that shortage of construction workers will be somewhat alleviated by spring from the return to civilian life of most of those now in the military services. Construction will appeal to a large number of the young men who had not previously been established in a trade or profession as it offers an opportunity to follow the outdoor life to which military service has accustomed many of them. A large number of these men are experienced in equipment handling; those from the Army Engineers and the Navy Seabees have learned certain basic phases of construction very well.

During the past fall there has been some tendency on the part of the released military personnel to take it easy for a while and to shop around for the $100 a week jobs they read about. It is expected that soon many service men will be ready to go to work and will be attracted to the higher hourly rates paid on construction. In addition, the large number of construction workers who went to build shipyards and stayed to build ships or similar units will be returning to construction. The guaranteed long work week in industrial jobs, with the large proportion of multiple-pay overtime, once made the take-home pay higher than that of a somewhat erratic construction payroll, but such is no longer the case.

Despite this somewhat optimistic outlook for construction workers, there will be many places and many skilled trades where help will be exceedingly short. For instance, there is said to be a shortage of bricklayers but there is a corresponding shortage of brick that will, even if in an undesirable way, compensate for the shortage of men in this craft.

Currently it is difficult to find men willing to work at laborers wages. During the period of extreme shortage ordinary unskilled workers were hired or held by giving them semi-skilled titles and pay. Now, no one wants to be a laborer so journeymen are doing much of the carrying and other manual work of construction, a factor that greatly increases the unit cost of labor.

Shortages engender low productivity

Partly as a result of greater demand for than supply of labor through the war years and continuing into the present the productivity of labor generally is claimed to be low on construction work throughout the country. So far as is known, no reliable figures have been assembled to show just what the productivity or efficiency "index" might be.

Low productivity is due partly to war-upgrading of workers from laborers to semi-skilled and on to skilled grades, without proper apprentice training or instruction, to increase an employee's wage and thus keep him on the payroll in a scarce labor market. Overtime fatigue may have been a wartime reason for slowing the work pace. This very probaly was augmented by an undesirable mental notion on the part of workers and at least the lower grades of supervisory forces on cost-plus war contracts. In the opinion of one contractor, low productivity will be alleviated only by unemployment reservoirs, making jobs difficult to get, coupled with weeding-out of inefficient personnel.

Non-working stewards, insistence on full-time manning of non-productive positions and refusal to use machines or new methods are noted by management as being a large factor in low job productivity and subsequent high cost. But

SKILLED WORKERS AND APPRENTICES IN CONSTRUCTION TRADES

Census year	Total skilled workers	Apprentices (all ages)	Beginning group (all workers under 20) percent of total	Old age group (over 65) percent of total	Median age of group 20–64
Average of Nine Major Construction Trades*					
1940	2,016,453	25,269	2.61	5.18	42.7
1930	2,527,042	25,668	3.13	5.38	39.9
1920	2,051,922	29,459	4.05	5.32	39.4
1910	1,891,411	28,011	7.12	4.81	38.2
1900	1,427,946	15,657	7.85	5.03	38.6
Carpenters					
1940	697,954	7,428	2.3	7.3	45.9
1930	933,514	4,138	1.8	8.0	43.7
1920	892,013	4,805	2.4	7.3	41.6
1910	823,151	6,069	4.5	6.6	39.6
1900	602,196	3,358	4.7	7.3	41.0
Brick and Stone Masons, Tilesetters, Stonecutters					
1940	136,512	1,500	2.2	5.6	43.9
1930	196,136	2,353	2.9	5.9	40.5
1920	154,787	1,434	2.0	7.2	41.6
1910	207,616	2,503	5.4	5.5	38.8
1900	215,263	2,416	5.8	5.4	39.4
Plasterers, Cement Finishers					
1940	69,250	500	1.9	3.8	42.4
1930	86,130	653	2.4	4.0	38.8
1920	46,268	398	1.8	5.8	38.2
1910	48,345	669	6.1	4.8	38.3
1900	35,661	700	5.2	5.3	40.1

Source: Apprentice-Training Service, War Manpower Commission from U. S. Census

*Includes, in addition to those shown, painters, plumbers and steamfitters, structural and ornamental metal workers, sheetmetal workers and electricians.

union organizations claim loudly that there are no restrictions on productivity or on firing workers who do not produce a full day's work. Commenting on conditions in New York City, Howard McSpedon, president, Building Trades Council, AFL, stated:

"Labor is fully aware of its responsibilities as a major factor in construction. Its problems are those of labor generally, as producers in a specific industry and as consumers both of its own products and those of others. . . .

"There is loose thinking on vital matters: first, stoppage of work due to jurisdictional disputes; second, so-called restrictive practices. A third—which is an allegation—concerns imposed maximum quotas of daily work and is unsound in fact. Each individual construction job depends upon the skill and organizing ability of the particular builder doing the job. Full cooperation is given by all the trades, under the established policy of a 'full day's work for a fair day's pay,' and in strict accordance with signed agreements."

But even contractors generally considered as being fair to labor and feeling that they get good treatment from unions admit that they do not fire a man just because he is slow or inefficient unless they can make an indisputable case that he is a chronic loafer.

Assurance against extension of nonproductive personnel and alleviation of some restrictive practices is contained in some recently negotiated agreements between employee and employer groups. In New York, for example, Local 3 of the electrical workers have agreed to use of long-barred mechanical tools on electrical installations and to work two 7-hr. shifts at straight time for the duration of the housing crisis.

A large amount of subconstracting has been found a successful expedient in the current labor situation. Small organizations, with the workers known personally to the boss, seem to have greater efficiency; thus the general contractor reduces his contingent risk.

Long range training

It is believed by responsible leaders of both employees and employers that the best means of increasing job productivity and providing adequate workers is training of young men under a real apprenticeship program. In recent years very few have received training under apprenticeship conditions and it is recognized that too frequently the apprentice has had to be his own teacher, through indifference of workers and desire of employers to get effective work immediately rather than train future craftsmen. Now, however, employers and employees are willing to do something about it as they have come to realize that the increasing median age in the skilled trades, shown in an accompanying sketch, indicates a potentially very serious shortage of skilled construction workers.

Veterans' training allowance

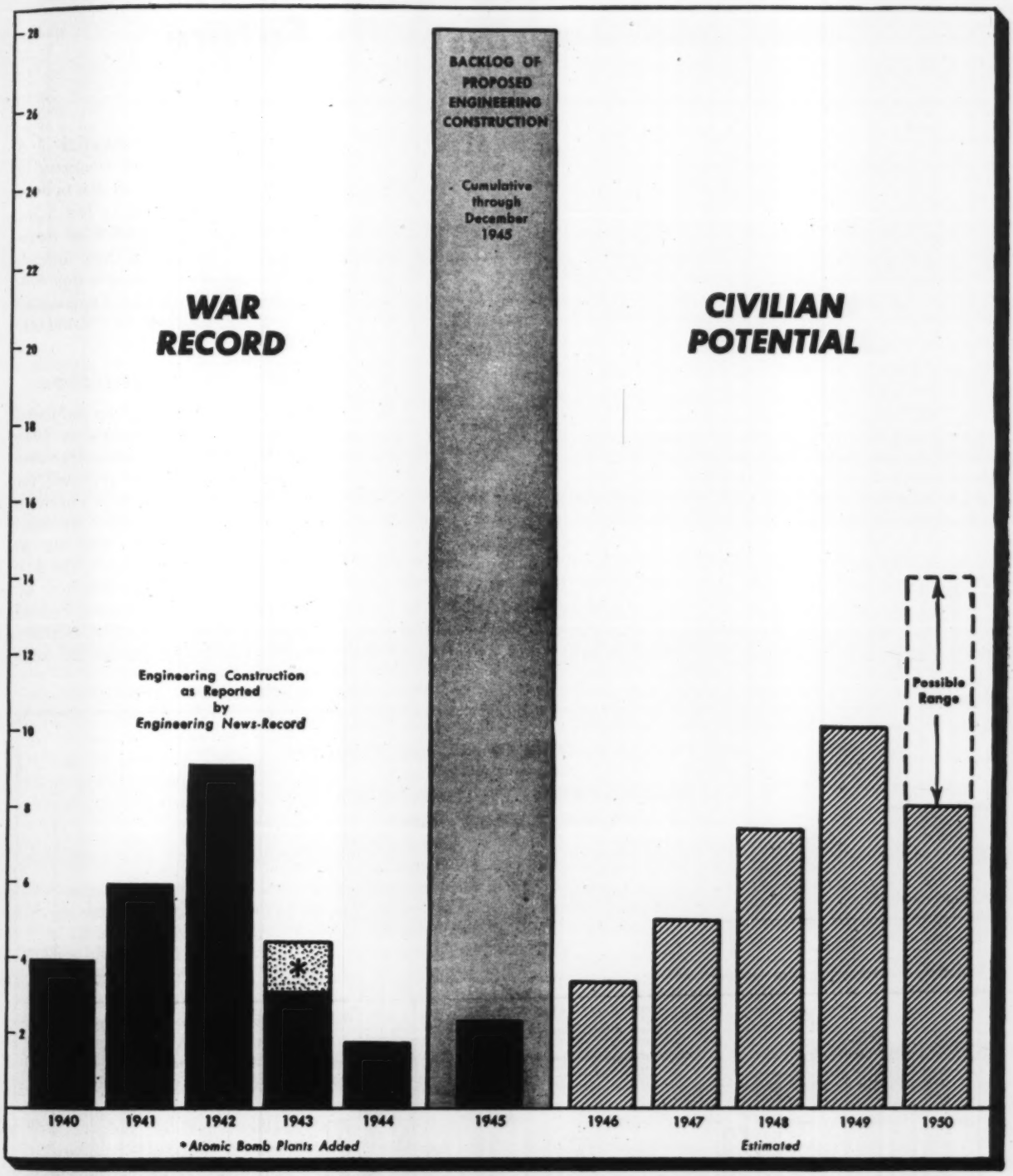
An important factor in the expected upsurge of apprentice training in construction is the training opportunity afforded veterans by the "G.I. Bill of Rights." Under the latter program veterans can receive the full subsistence amount allowed for training, $65 per month for men without dependents or $90 with dependents, to supplement wages paid under the normal apprentice training agreement, provided, however, that total income shall not exceed the rates paid to journeymen workers

There seems to be little possibility that there will be too many apprentices. The general committee on apprenticeship for the construction industry has found that 249,000 apprentices must be continually in training to supply 40,000 new journeymen annually and thus maintain the 2,016,000 craftsmen that were in the industry in 1940. Only a few more than 25,000 apprentices were in training in 1940.

Some unions now are giving special attention to veterans with some training during their military tenure by starting them in advance grades. The usual union prerogative of giving preference to sons and friends of members and limiting admission in areas where there is any possibility that new admissions would reduce the amount of work for members continues in force though not officially recognized.

In conclusion, it might be restated that: (1) contractors who have active jobs are less concerned than others about labor supply and productivity; (2) small organizations with the boss close to the workers may have an advantage; (3) construction labor wants more money but seems satisfied with present hours and working conditions; (4) enough workers, not all good, will be found for the materials available; (5) organizations who try to understand the workers have an advantage; (6) now is the most opportune time for organized labor to prove its dependability and its right to better conditions by better productivity.

CONSTRUCTION



BEGINNING . . . a 12-page review of past and present trends and future outlook:

CONSTRUCTION VOLUME · FINANCING · COSTS

Construction Industry Logs the War Years and Appraises its Future

Engineering construction during the defense-war period from July, 1940 through August, 1945 totalled $22.6 billions as recorded by *Engineering News-Record* plus $2.4 billions in U. S. overseas construction all over the world as recently reported by the Department of Commerce, through June, 1945, a 5-year war construction job totalling $25 billions.

For the next four years, 1946 through 1949, $26 billions is projected as the engineering construction volume to be expected and this estimate is backed by a continuous inventory of proposed engineering construction that showed a measured backlog of $28,000,000,000 at the close of 1945. This 4-year total of $26 billions for heavy construction volume represents an estimated sustained rate of gain based on the 1945 recorded total of 50 percent per year, the highest previously recorded rate.

1—ESTIMATED TOTAL CONSTRUCTION

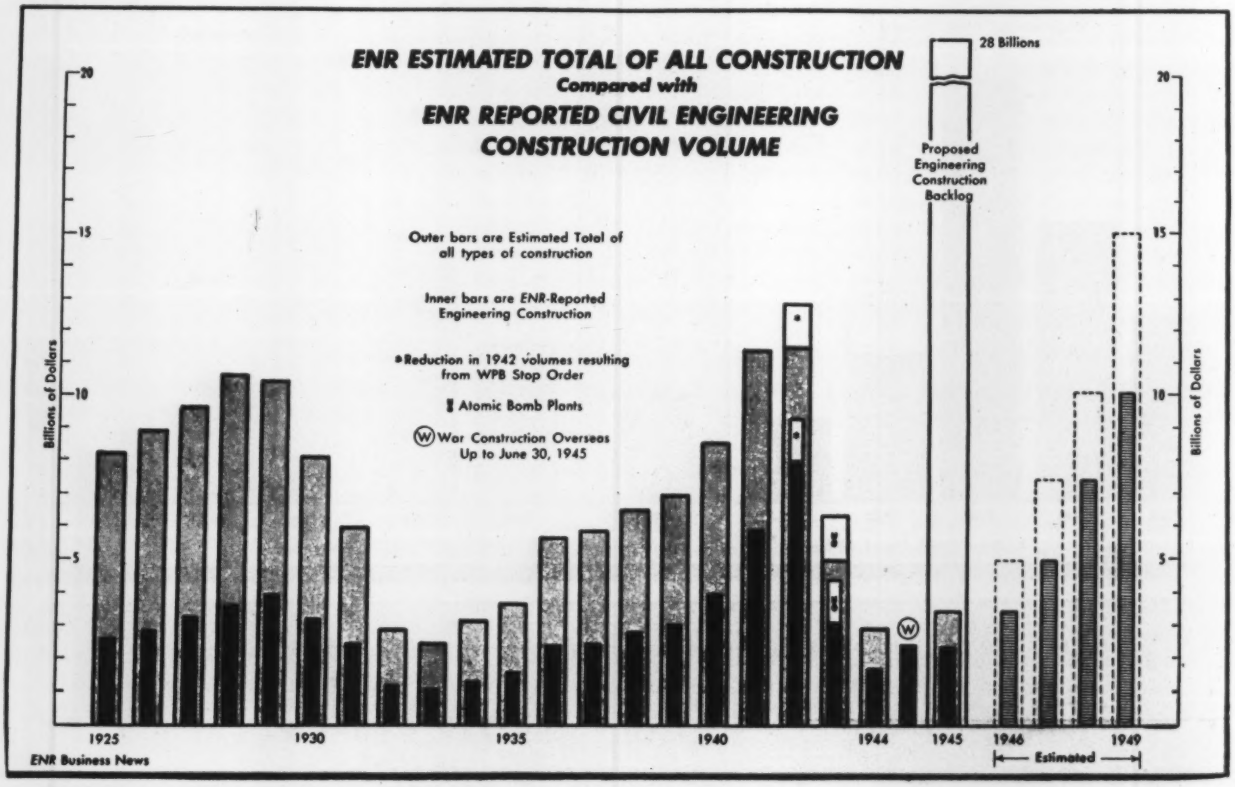
(Millions of Dollars)

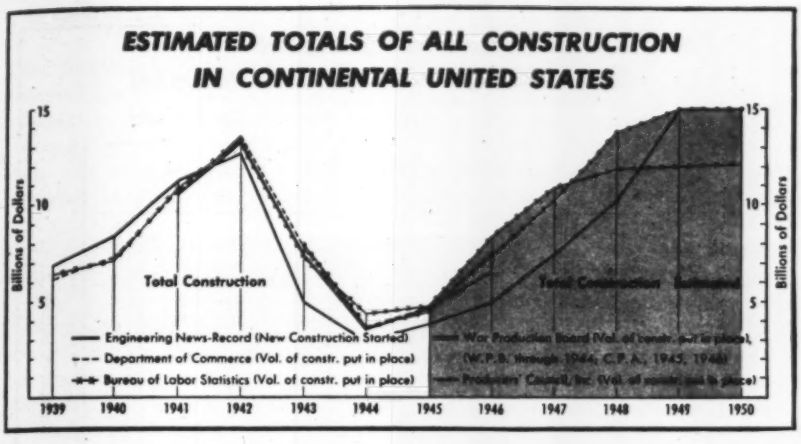
	Public	Private	Total	ENR Vol. Index
1925	2,476	5,702	8,178	201
1926	2,670	6,208	8,878	228
1927	3,073	6,522	9,595	263
1928	3,480	7,100	10,580	287
1929	3,263	7,114	10,377	317
1930	3,363	4,695	8,058	260
1931	3,098	2,832	5,930	220
1932	1,918	921	2,839	127
1933	1,533	907	2,440	102
1934	2,373	731	3,104	114
1935	2,460	1,221	3,680	134
1936	3,140	2,450	5,590	185
1937	2,806	3,046	5,852	172
1938	3,680	2,800	6,480	197
1939	3,750	3,224	6,974	211
1940	4,550	3,960	8,510	269
1941	7,200	4,196	11,396	375
1942	11,061	1,760	12,821	553
1943	3,820	1,180	5,000	176
1944	1,815	1,085	2,900	96
1945	1,490	2,308	3,798	122

Engineering construction closed 1945 with a 32 percent gain in volume over 1944 and contracts were being awarded in the third quarter at a rate 200 percent higher than in the previous January. A 61 percent increase was established in the second half over the first half. This pace was set despite handicaps due to materials and labor shortages and an abnormally high ratio of bid rejections due to high prices variously ascribed to low labor efficiencies and uncertainties of materials supply. In spite of these difficulties, the engineering construction volume recorded in 1945 by *Engineering News-Record* totalled $2,289,408,000 for the year.

ESTIMATED TOTAL CONSTRUCTION

Total volume of construction estimated by *Engineering News-Record* in 1945 is, $3,798,000,000, 31 percent greater than the $2,900,000,000 reported for 1944. Private engineering construction accounted for this increase, amounting to $1,910,000,000, or 50 percent of the total estimate, the first time since 1930 that private has accounted for 50 percent or more. Federal work dropped sharply in 1945 to $880,000,000, but 23 percent of the total,





whereas in 1944 it accounted for 49 percent and in 1943, 70 percent. State and municipal construction accounted for $610,000,000 or 16 percent of the 1945 estimated total and recorded a 50 percent increase over the $405,000,000 of 1944. One and two-family residential construction, estimated at $398,000,000 in 1945, formed 11 percent of the nation's total and is a 53 percent gain over 1944. The rise of total estimated private construction (mostly during the latter part of 1945) is shown by its $2,308,000,000 total, or 61 percent of the estimated total construction for 1945. This is the highest ratio of private construction to the nation's total since 1929 when it was 69 percent. Estimated public construction in 1945, $1,490,000,000 dropped to 39 percent of the estimated total.

OVERSEAS WAR CONSTRUCTION

Overseas war construction by U. S. forces totalled $2,400,000,000 from 1942 through June, 1945, $1,327,000,000 in the British Commonwealth, of which $23,000,000 was in United Kingdom, $238,000,000 in Australia and New Zealand, $370,000,000 in Canada, $126,000,000 in India, $77,000,000 in Bermuda, $186,000,000 in British Caribbean possessions, $146,000,000 in British Pacific Islands, $123,000,000 in Newfoundland and Labrador, $38,000,000 in other British possessions; in American Republics, $252,000,000, $52,000,000 in Brazil, $91,000,000 in Cuba, $34,000,000 in Panama and $75,000,000 in other South American and Central American countries; in France and possessions, $122,000,000, $53,000,000 in France proper, $33,000,000 in North Africa, $37,000,000 in New Caledonia. In China $73,000,000 went into U. S. construction, $54,000,000 in Greenland. $67,000,000 in Iran, $64,000,000 in Italy, $192,000,000 in Japanese Islands in the Pacific, $173,000,000 in the Philippines and $89,000,000 in other overseas construction.

FUTURE OUTLOOK

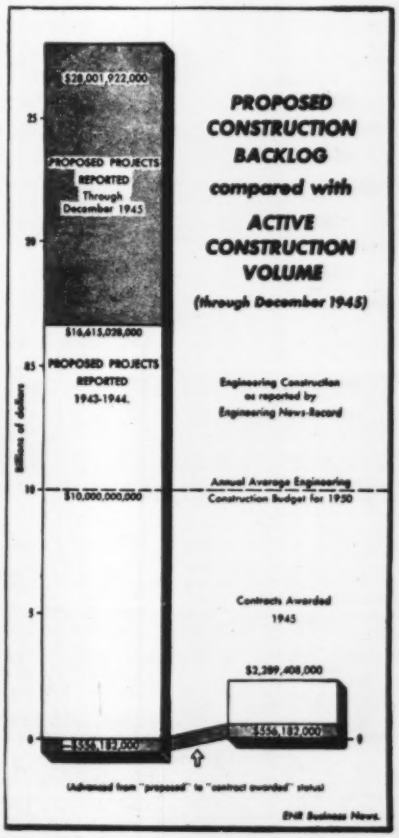
Estimated total construction forecast by *Engineering News-Record* would put the 1946 total of recorded heavy engineering construction at $3.3 billions and total estimated construction at $5.8 billions, both 50 percent increases over 1945 volume. Other estimates for 1946 include: Bureau of Labor Statistics $8.3 billions, a 76 percent gain over last year; Civilian Production Administration $6.5 billions, a 38 percent gain over the WPB estimate for 1945; Department of Commerce, $7.5 billions, a 60 percent increase over 1945.

Projecting ahead for 4 years, ENR estimates that heavy engineering construction can reach a rate of $10,000,000,000 and total construction a rate of $15.0 billions per year by 1949. This estimate is based on a rate of gain equal to the highest annual increase on record for engineering construction, or 50 percent per year. On this basis 1947 would have a $8.7 billions year, 1948 a $13 billions and 1949 over $15.0 billions. These figures supersede those on the accompanying chart. The Bureau of Labor Statistics estimates 1947 at $10.8 billion year, 1948, $11.8 billions; 1949, $11.9 billions and 1950 $12.1 billions. The Producers Council forecasts a $10 billion dollar year in 1947, $14.4 billions in 1948 and $15 billions in 1949-50.

PROPOSED ENGINEERING CONSTRUCTION BACKLOG

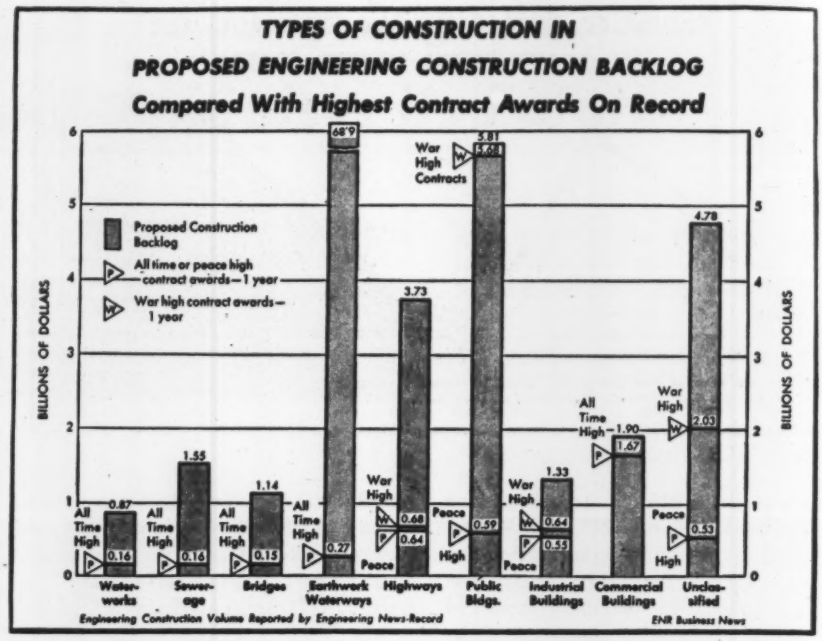
October 1945 marked the official conversion date of construction back to civilian status. ENR's postwar planning progress reporting was superseded by a civilian measuring rod of proposed engineering construction backlog compared with advance to active status, which would show the flow of new proposed work into the backlog and measure the flow of recorded proposed construction out of the backlog into contracts awarded.

This proposed construction backlog accumulated from January 1943 through December 1945 is $28,001,922,000. This total remains after $556,182,000 worth of projects that have already advanced to active status of contract awarded has been subtracted from the backlog. During the year 1945, $11,386,894,000 in proposed construction projects were added to the measured backlog over and above the $556,182,000 that moved out of proposed and into contract awarded status. This $11,386,894,000 can be compared with the amount added during 1944, $11,513,939,000, and in 1943, $5,101,089,000.



Breaking down the $28,001,922,000 backlog geographically, the Middle-Atlantic states lead with their $7,036,-974,000, or 25 percent of the country's total. The other sections follow: West of the Mississippi, 22 percent; Far Western, 21 percent; Middle West, 18 percent; Southern 9 percent; New England, 5 percent.

The proposed backlog for public construction, $23,956,942,000 is 86 percent of the total with $4,044,980,000 in proposed private construction making up the remaining 14 percent. The types of construction making up the backlog are: earthwork and drainage, $6,892,444,000; leader, with 25 percent of the total, public buildings, second with 21 percent; unclassified, 17 percent; highways, 13 percent; commercial buildings, 7 percent; industrial buildings, 5 percent; sewerage, 5 percent; bridges, 4 percent and waterworks, 3 percent.



II—BACKLOG OF PROPOSED ENGINEERING CONSTRUCTION

As Reported to Engineering News-Record through December, 1945
(thousands of dollars)

States	PUBLIC WORK: Water-works	Sewerage	Bridges	Earthwork Irr.-Drain.	Streets and Roads	Buildings	Un-classified	Federal Govern-ment Work	PRIVATE WORK: Bridges	Indus-trial Bldgs.	Commer-cial Bldgs.	Un-classified	CONSTRUCTION: Private	Public	Total	States
Me.	381	3,181	733	1,887	33,986	25,391	20,474	9,613	.....	855	2,830	358	4,043	86,033	90,076	Me.
N. H.	1,311	910	5,810	1,397	12,148	16,136	15,720	10,305	.....	9,223	5,530	8,457	23,210	53,432	76,642	N. H.
Vt.	1,062	1,507	.....	57,376	1,048	7,639	13,816	61,265	.....	280	1,600	420	2,300	82,448	84,748	Vt.
Mass.	31,982	53,976	26,251	24,699	50,470	203,424	71,956	146,228	.....	12,150	57,225	2,811	72,186	462,758	534,944	Mass.
R. I.	1,159	3,437	14,925	526	20,860	27,211	12,483	17,755	.....	5,563	15,583	920	22,066	80,601	102,667	R. I.
Conn.	2,123	20,860	3,890	80,703	76,028	99,421	45,592	113,344	25	11,134	104,338	4,383	119,880	328,617	448,497	Conn.
New Eng.	**38,018**	**83,871**	**51,609**	**166,588**	**194,540**	**379,222**	**180,041**	**358,510**	**25**	**39,205**	**187,106**	**17,349**	**243,685**	**1,093,889**	**1,337,574**	**New Eng.**
N. Y.	123,643	267,710	178,382	114,284	414,847	1,130,627	1,370,867	246,093	.....	99,170	353,081	4,844	457,095	3,600,360	4,057,455	N. Y.
N. J.	59,627	55,009	34,319	22,796	109,787	139,630	62,895	24,805	.....	50,921	54,621	10,946	116,488	484,063	600,551	N. J.
Pa.	56,880	146,764	56,664	208,250	239,947	266,888	267,460	293,731	138	61,036	142,809	15,869	219,852	1,242,853	1,462,705	Pa.
Md.	40,552	24,134	22,111	14,034	134,039	163,982	25,785	64,688	.....	8,200	48,270	3,255	59,725	424,637	484,362	Md.
D. C.	8,897	12,138	13,700	2,500	40,271	217,594	83,643	213,062	.....	40	14,970	408	15,418	378,743	394,161	D. C.
Del.	178	.....	25,000	250	.....	2,970	2,604	3,010	.....	2,700	3,600	438	6,738	31,002	37,740	Del.
Mid. Atl.	**289,777**	**505,755**	**330,176**	**362,114**	**938,891**	**1,921,691**	**1,813,254**	**845,389**	**138**	**222,067**	**617,351**	**35,760**	**875,316**	**6,161,658**	**7,036,974**	**Mid. Atl.**
Va.	2,866	19,733	31,902	118,968	39,867	68,534	27,838	140,410	.....	44,852	5,840	13,709	64,401	309,708	374,109	Va.
W. Va.	402	13,406	1,033	19,500	4,999	21,056	37,133	30,076	.....	4,143	2,000	294	6,437	97,529	103,966	W. Va.
N. C.	4,448	4,152	4,483	201,402	15,229	52,491	26,386	233,731	95	14,292	28,335	9,402	52,124	308,591	360,715	N. C.
S. C.	3,049	2,302	2,834	99,310	8,925	37,924	20,317	117,578	.....	21,068	5,600	4,689	31,357	174,661	206,018	S. C.
Ga.	2,281	2,587	275	31,931	4,219	46,021	26,638	55,415	.....	42,745	24,215	12,316	79,276	113,952	193,228	Ga.
Fla.	19,305	45,242	20,223	76,081	17,461	62,316	48,246	106,375	.....	8,020	7,525	14,287	29,832	288,774	318,606	Fla.
Ala.	3,850	3,622	1,332	64,037	2,248	43,333	14,009	83,215	.....	2,990	6,918	12,018	21,926	132,431	154,357	Ala.
Miss.	1,428	5,422	673	11,567	3,568	18,095	11,118	25,917	.....	1,965	1,300	13,560	16,825	51,871	68,696	Miss.
La.	5,088	16,663	21,777	118,547	7,398	60,302	54,854	154,497	600	13,153	20,583	8,932	43,268	284,629	327,897	La.
Ky.	560	6,148	8,664	.....	41,919	12,922	7,072	11,045	.....	7,151	350	5,350	12,851	77,285	90,136	Ky.
Tenn.	1,940	28,416	3,159	69,573	25,068	105,328	18,314	100,825	.....	7,104	10,991	4,771	22,866	251,798	274,664	Tenn.
South.	**45,117**	**147,693**	**96,355**	**810,916**	**170,901**	**528,322**	**291,925**	**1,059,084**	**695**	**167,483**	**113,657**	**99,328**	**381,163**	**2,091,229**	**2,472,392**	**South.**
Ohio.	40,901	111,331	130,237	40,961	295,670	352,220	119,344	67,051	1,000	113,766	104,173	64,881	283,820	1,090,664	1,374,484	Ohio
Ind.	3,327	49,645	51,890	30,411	41,942	115,640	37,596	63,457	.....	73,863	31,879	18,755	124,497	330,451	454,948	Ind.
Ill.	72,211	163,788	82,155	191,731	345,465	382,451	228,967	197,501	.....	71,478	59,802	17,934	149,214	1,466,768	1,615,982	Ill.
Wis.	3,950	24,525	12,459	648	71,174	70,706	28,765	22,010	.....	30,023	14,903	7,817	52,743	212,227	264,970	Wis.
Mich.	52,994	126,825	66,513	10,824	136,939	544,962	300,302	57,389	.....	34,306	12,005	54,815	101,126	1,239,359	1,340,485	Mich.
Mid. West.	**173,383**	**476,114**	**343,254**	**274,575**	**891,190**	**1,465,979**	**714,974**	**407,468**	**1,000**	**323,436**	**222,762**	**164,202**	**711,400**	**4,339,469**	**5,050,869**	**Mid. West.**
Minn.	7,776	14,986	8,392	23,369	25,537	88,061	42,097	19,453	25	30,857	23,374	9,084	63,340	210,218	273,558	Minn.
Iowa	2,651	9,849	7,025	23,113	7,861	34,864	12,519	35,852	.....	6,922	6,083	9,591	22,596	97,882	120,478	Iowa
Mo.	20,053	30,732	26,167	160,811	296,918	105,713	90,220	206,983	.....	76,305	47,269	23,348	146,922	730,614	877,536	Mo.
Ark.	3,440	4,624	21,539	14,960	17,618	22,773	33,889	21,891	.....	7,805	4,775	9,353	21,933	118,843	140,776	Ark.
N. D.	1,262	1,097	173	229,376	60	7,888	4,011	233,257	.....	190	530	4,807	5,527	243,867	249,394	N. D.
S. D.	2,369	1,513	80	275,103	1,125	6,608	5,310	278,528	.....	.....	750	3,444	4,194	292,108	296,302	S. D.
Neb.	3,038	2,264	800	184,873	21,937	30,164	20,818	209,353	.....	2,578	4,550	3,549	10,677	263,894	274,571	Neb.
Kan.	4,296	3,647	2,121	162,989	4,251	25,398	6,187	177,621	.....	12,640	3,300	29,902	45,842	208,889	254,731	Kan.
Okla.	19,663	10,601	8,736	58,120	58,064	84,510	71,629	63,121	35	4,685	30,286	62,610	97,616	311,323	408,939	Okla.
Tex.	64,228	62,406	44,195	533,815	265,273	316,939	205,566	516,961	625	228,197	341,853	99,105	669,780	1,492,422	2,162,202	Tex.
Mont.	2,659	5,282	63,748	307,830	26,651	25,969	11,486	306,348	.....	1,363	1,925	3,750	7,038	443,625	450,663	Mont.
Wyo.	45	650	785	221,531	2,020	3,335	3,169	223,231	.....	1,115	150	2,615	3,880	231,535	235,415	Wyo.
Colo.	15,024	1,642	290	334,221	12,788	28,877	13,427	352,473	.....	1,630	9,220	2,151	13,001	406,269	419,270	Colo.
N. M.	1,043	235	.....	48,451	837	11,853	33,612	55,236	.....	10,445	2,050	30,717	43,212	96,031	139,243	N. M.
W. of Miss.	**147,547**	**149,528**	**184,051**	**2,578,562**	**740,940**	**792,952**	**553,940**	**2,700,388**	**685**	**384,732**	**476,115**	**294,026**	**1,155,558**	**5,147,520**	**6,303,078**	**W. of Miss.**
Idaho.	1,080	1,731	3,946	171,744	5,937	17,353	9,396	175,562	.....	6,377	1,950	5,356	13,683	211,187	224,870	Idaho
Utah.	5,262	11,898	1,950	144,870	42,582	17,545	13,661	153,651	.....	1,105	2,600	75	3,780	237,777	241,557	Utah
Ariz.	389	618	.....	595,820	6,910	9,784	18,805	609,985	.....	859	4,251	5,333	10,423	632,326	642,749	Ariz.
Nev.	415	793	4,500	38,953	41,126	14,284	5,199	21,333	.....	840	6,875	62	7,777	105,270	113,047	Nev.
Wash.	50,822	29,735	46,359	579,662	170,744	171,340	59,232	631,389	.....	27,902	28,628	9,760	66,187	1,107,594	1,173,781	Wash.
Ore.	6,738	18,617	22,654	252,274	88,585	65,534	18,297	276,172	.....	27,698	20,275	11,738	59,711	472,699	532,410	Ore.
Calif.	116,473	122,702	56,141	916,366	435,331	420,796	289,515	987,513	631	129,674	219,742	166,250	516,297	2,356,324	2,872,621	Calif.
Far West	**179,879**	**186,094**	**135,550**	**2,699,689**	**791,215**	**716,636**	**414,105**	**2,855,605**	**631**	**194,355**	**284,298**	**198,574**	**677,858**	**5,123,177**	**5,801,035**	**Far West**
U. S.	873,721	1,549,055	1,141,004	6,892,444	3,727,677	5,804,802	3,968,239	8,226,304	3,174	1,331,278	1,901,289	809,239	4,044,980	23,956,942	28,001,922	U. S.
Canada	87,740	178,895	211,048	421,143	1,171,868	392,452	902,686	.....	.....	91,976	108,320	492,098	692,394	3,345,832	4,058,226	Canada

ENR REPORTED CONSTRUCTION UP 32%

Civil Engineering construction in continental United States totals $2,289,408,000 in 1945, as reported to *Engineering News-Record*. This is 32 percent greater than the $1,729,753,000 reported in 1944, but in turn is 24 percent below the volume of the last pre-war year of 1939 and 75 percent below the record high year of 1942.

The strong impetus given private construction with the end of the war resulted in its photo-finish with public construction as each makes up 50 percent of the nation's total. Private construction recorded in 1945 totals $1,144,384,000, 215 percent greater than the total for 1944, with public construction, $1,145,024,000, a 16 percent decrease from the 1944 total. This drop in public work is due entirely to the decrease in federal work to $750,000,000, 33 percent below the 1944 total. State and municipal construction totals $395,024,000 in 1945, an increase of 60 percent over 1944.

The most spectacular increase in 1945 occurred as private industrial building volume soared to $635,170,000, an all time high. This volume is 7 percent greater than the previous high year of 1940, when $594,000,000 was recorded as the private industrial building volume, and 265 percent greater than the last full war year of 1944.

The effect of the progress of the war during 1945 is reflected sharply in industrial building volume on a weekly average basis. Between January 1, 1945, and May 8, 1945, the end of the war with Germany, the industrial building weekly average was $6,000,000; between May 8, and the surrender of Japan on August 15, the weekly average had jumped to $12,000,000; and from the end of the war to the end of the year the weekly average went up to $21,000,000.

To the private industrial volume of $635,170,000 in 1945, can be added $73,399,000 in federally-owned, privately operated industrial buildings and $110,332,000 in federally-owned, federally-operated plants to swell the private and federal plant construction to $818,901,000, or 113 percent greater than the corresponding total industrial building volume of $385,050,000 in 1944.

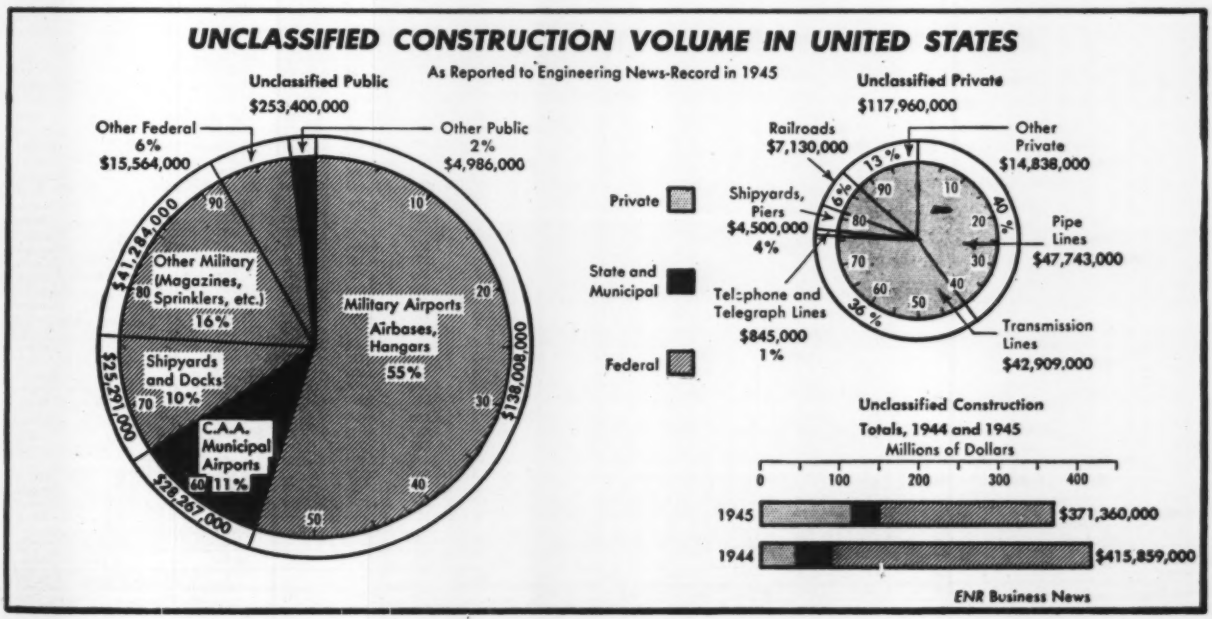
Commercial building and large scale private housing volume in 1945, $387,273,000, recorded an increase of 176 percent over the $140,418,000 reported in 1944. Mass housing reported by *ENR* includes the $387,273,000 in private projects, $29,891,000 in federal military housing, and $43,526,000 in war defence housing making the overall 1945 total, $460,690,000, 79 percent greater than the like total of 1944.

Public building for the year, $462,909,000 dropped 30 percent below the $657,539,000 volume of 1944. Publicly financed housing and industrial type buildings have been transferred from the public building total and have been included with "commercial" buildings and "industrial" buildings in the paragraphs above and in the charts on the accompanying page. The total for all other types of public buildings in 1945, $389,592,000, is 21 percent greater than the 1944 volume but is 43 percent below the 1943 volume of new public building.

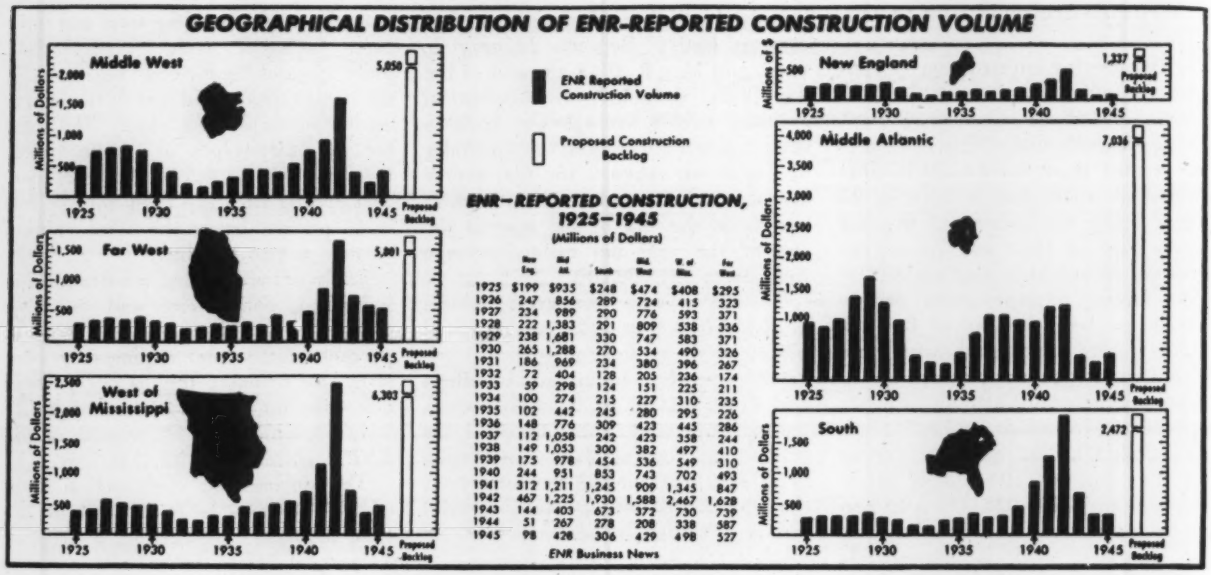
Engineering building construction—industrial, commercial and public—totaled $1,485,352,000 for 1945, 65 percent of the total engineering construction volume: this is 53 percent below the similar 1944 figure of $972,271,000, which was 56 percent of the *ENR* reported total for that year.

The unclassified construction total of $371,360,000 is 16 percent of the total reported construction, a drop of 11 percent below the $415,859,000 recorded in 1944. Private unclassified construction, $117,960,000 is 149 percent greater than in 1944, but public construction $253,400,000 decreased 31 percent below the $368,452,000 in 1944.

The drop in public unclassified construction below 1944 is largely due to the 33 percent decrease in federal airbases, hangars and facilities, and a 58 percent decrease in other military construction, i.e., docks, magazines and storage. State and municipal unclassified construction, including $28,267,000 in CAA and municipally financed airports, is 13 percent of the public total.



GEOGRAPHICAL DISTRIBUTION OF ENR-REPORTED CONSTRUCTION VOLUME



ENR—REPORTED CONSTRUCTION, 1925–1945

(Millions of Dollars)

	New Eng.	Mid Atl.	South	Mid. West	W. of Miss.	Far West
1925	$199	$935	$248	$474	$408	$295
1926	247	856	289	724	415	323
1927	234	989	290	776	593	371
1928	222	1,383	291	809	538	336
1929	238	1,681	330	747	583	371
1930	265	1,288	270	534	490	326
1931	186	969	234	380	396	267
1932	72	404	128	205	236	174
1933	59	298	124	151	225	211
1934	100	274	215	227	310	235
1935	102	442	245	280	295	226
1936	148	776	309	423	445	286
1937	112	1,058	242	423	358	244
1938	149	1,053	300	382	497	410
1939	175	978	454	536	549	310
1940	244	951	853	743	702	493
1941	312	1,211	1,245	909	1,345	847
1942	467	1,225	1,930	1,588	2,467	1,628
1943	144	403	673	372	730	739
1944	51	267	278	208	338	587
1945	98	428	306	429	498	527

ENR Business News

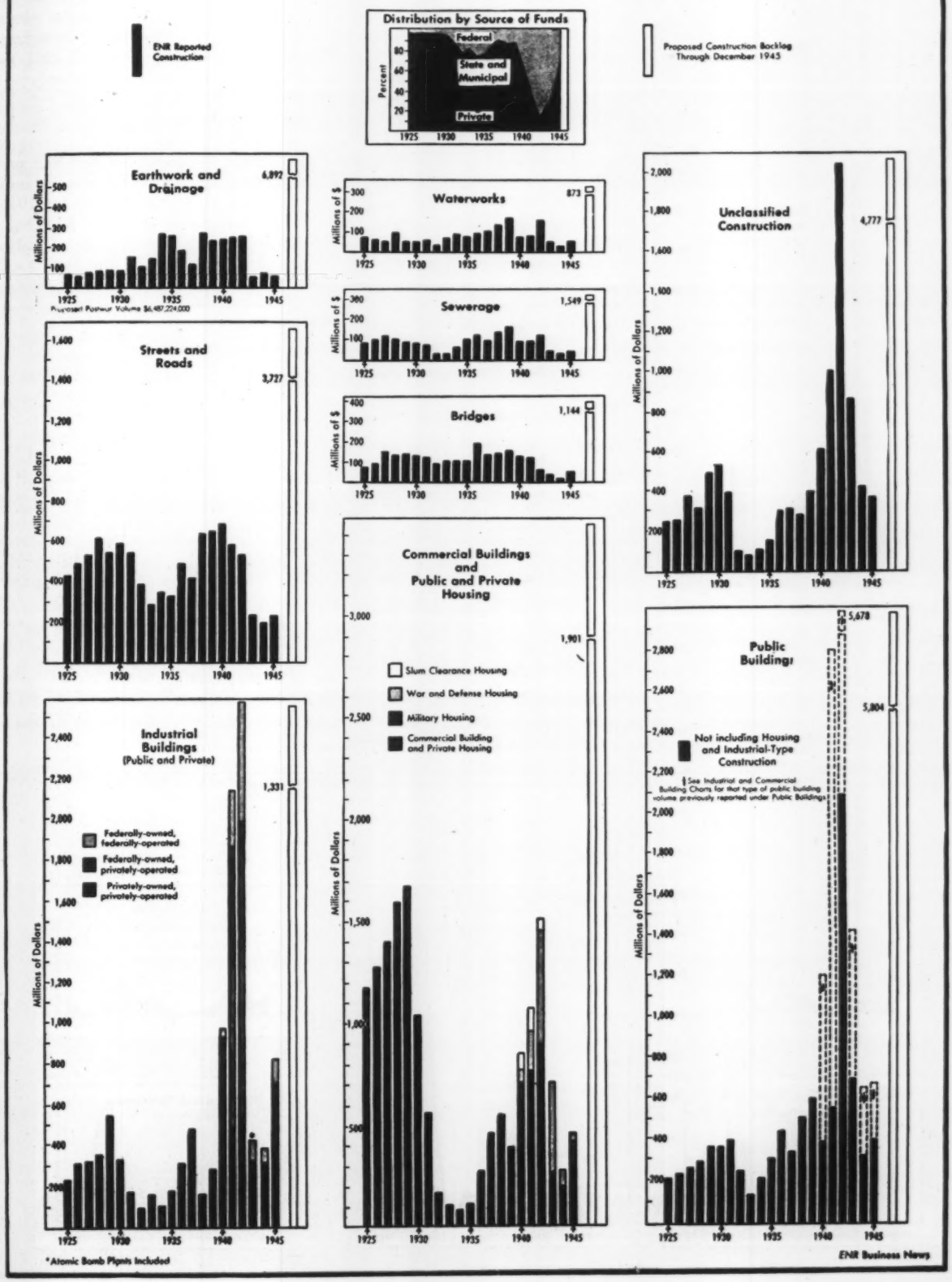
III—ENGINEERING CONSTRUCTION REPORTED TO ENGINEERING NEWS-RECORD IN 1945

Engineering News-Record *reports continental U. S. Construction projects of the following minimum costs—waterworks, excavation, drainage and irrigation,* $15,000; *other public works,* $25,000; *industrial buildings,* $40,000; *other buildings,* $150,000;

Thousands of Dollars (000 Omitted)

States	Water-works	Sewer-age	Bridges	Earthwork Irr.-Drain.	Streets and Roads	BUILDINGS Indus-trial	BUILDINGS Commer-cial	BUILDINGS Public	Un-classified	Federal Gov't. Work	All Construction Private	All Construction Public	1945 Total 52 Weeks	1944 Total 52 Weeks	% Change 1944 to 1945	States
Maine	134	126	76	20	52	1,695	620	1,594	1,724	2,711	2,819	3,222	6,041	5,841	+ 20	Maine
New Hampshire	49	.....	517	.....	169	1,425	2,250	439	47	219	3,675	1,221	4,896	2,264	+116	New Hampshire
Vermont	.....	134	30	11	.....	587	200	100	130	126	902	290	1,192	849	+ 40	Vermont
Massachusetts	1,104	804	561	914	2,645	14,419	7,179	11,414	7,303	14,011	22,225	24,118	46,343	19,447	+138	Massachusetts
Rhode Island	49	236	280	174	416	1,669	3,330	513	1,554	1,697	5,299	2,922	8,221	8,565	– 4	Rhode Island
Connecticut	1,024	381	1,510	1,209	4,224	13,021	6,520	3,755	661	4,442	19,693	12,612	32,305	15,091	+114	Connecticut
New England	**2,360**	**1,681**	**2,974**	**2,328**	**7,506**	**32,816**	**20,099**	**17,815**	**11,419**	**23,206**	**54,613**	**44,385**	**98,998**	**51,257**	**+ 93**	**New England**
New York	2,521	2,964	4,382	540	11,608	32,153	60,486	9,489	16,290	15,849	93,764	46,649	140,433	34,756	+304	New York
New Jersey	54	.....	1,655	1,047	2,567	24,511	5,467	9,542	5,170	12,789	31,938	18,075	50,013	63,180	– 21	New Jersey
Pennsylvania	6,618	902	3,268	1,073	13,771	40,139	55,308	22,656	15,082	30,907	101,640	57,177	158,817	91,915	+ 73	Pennsylvania
Maryland	444	2,335	348	27	4,594	4,936	7,354	21,657	10,377	34,343	12,551	39,521	52,072	53,904	– 3	Maryland
District of Columbia	462	849	2,605	.....	1,865	190	3,750	9,839	1,310	11,059	3,955	17,005	20,960	18,793	+ 12	District of Columbia
Delaware	.....	.....	.....	.....	627	325	3,589	1,133	931	1,249	4,714	1,891	6,605	4,432	+ 49	Delaware
Middle Atlantic	**10,099**	**7,050**	**12,348**	**2,687**	**35,032**	**102,254**	**135,954**	**74,316**	**49,160**	**106,096**	**248,562**	**180,338**	**428,900**	**266,980**	**+ 61**	**Middle Atlantic**
Virginia	1,122	3,574	1,359	859	8,726	8,647	1,200	20,941	6,572	30,870	11,399	41,601	53,000	60,558	– 13	Virginia
West Virginia	28	.....	129	59	4,031	9,199	150	691	1,271	1,549	9,849	5,709	15,558	16,138	– 4	West Virginia
North Carolina	979	446	2,322	1,252	6,607	7,752	5,210	8,623	8,983	15,780	15,929	26,245	42,174	19,732	+114	North Carolina
South Carolina	108	33	639	531	2,037	877	.....	1,706	2,039	2,954	2,195	5,775	7,970	11,711	– 32	South Carolina
Georgia	372	211	476	.....	5,422	5,309	1,473	6,605	6,512	11,234	8,180	18,290	26,380	20,913	+ 26	Georgia
Florida	1,967	208	2,135	442	8,240	4,863	900	6,010	18,037	22,039	8,641	34,161	42,802	50,094	– 15	Florida
Alabama	561	349	607	73	4,714	5,358	1,143	11,167	10,053	19,646	8,235	25,790	34,025	19,964	+ 70	Alabama
Mississippi	30	84	.....	738	134	2,844	150	3,191	3,988	6,017	4,855	6,304	11,159	11,473	– 3	Mississippi
Louisiana	856	567	422	6,554	2,461	4,382	343	2,133	14,555	11,699	14,892	17,381	32,273	37,778	– 15	Louisiana
Kentucky	479	.....	306	232	6,791	3,350	1,850	3,751	1,661	3,845	6,287	12,133	18,420	10,102	+ 82	Kentucky
Tennessee	329	.....	2,974	345	2,901	4,340	300	10,268	1,620	11,086	4,765	18,312	23,077	19,667	+ 17	Tennessee
Southern	**6,831**	**5,472**	**11,369**	**11,085**	**52,064**	**56,921**	**12,719**	**75,086**	**75,291**	**136,719**	**95,227**	**211,611**	**306,838**	**278,130**	**+ 10**	**Southern**
Ohio	3,294	835	1,416	2,785	22,079	88,296	32,758	7,368	8,668	12,508	124,474	43,825	167,499	55,216	+203	Ohio
Indiana	821	373	153	80	7,100	17,927	1,377	15,942	1,706	16,864	19,394	26,085	45,479	32,395	+ 40	Indiana
Illinois	2,622	1,841	2,072	3,545	16,465	61,371	9,622	16,611	5,700	15,568	73,422	46,428	119,850	56,970	+110	Illinois
Wisconsin	1,507	1,113	442	21	2,147	25,539	2,530	6,286	1,467	6,349	29,837	12,005	41,842	35,101	+ 17	Wisconsin
Michigan	1,810	591	57	485	2,412	34,991	5,452	7,570	1,862	7,163	48,734	14,496	55,230	28,598	+ 93	Michigan
Middle West	**10,055**	**4,753**	**4,140**	**6,916**	**50,283**	**228,114**	**51,739**	**53,777**	**19,403**	**58,452**	**287,061**	**142,839**	**429,100**	**208,280**	**+106**	**Middle West**
Minnesota	1,019	106	280	136	3,618	11,749	7,110	2,968	2,859	1,318	20,057	9,788	29,845	15,080	+ 98	Minnesota
Iowa	679	.....	1,308	1,035	6,341	1,301	1,428	2,408	2,115	2,489	4,725	11,890	16,615	12,523	+ 33	Iowa
Missouri	639	388	734	864	3,849	18,487	5,432	10,918	8,909	11,560	31,609	18,611	50,220	21,631	+132	Missouri
Arkansas	277	243	2,550	698	425	1,970	.....	2,095	1,442	2,699	3,096	6,604	9,700	35,767	– 73	Arkansas
North Dakota	86	44	.....	34	3,929	330	.....	1,719	1,138	1,939	959	6,321	7,280	3,822	+ 90	North Dakota
South Dakota	24	137	33	30	526	280	.....	650	3,652	2,020	2,430	2,902	5,332	729	+641	South Dakota
Nebraska	716	70	213	1,518	2,704	486	600	8,082	5,105	10,959	3,650	15,844	19,494	23,756	– 18	Nebraska
Kansas	239	142	467	251	5,347	1,573	.....	9,012	4,232	10,315	4,091	17,172	21,263	17,865	+ 18	Kansas
Oklahoma	1,536	152	2,846	449	6,253	1,265	450	11,071	5,690	14,087	6,152	23,560	29,712	21,687	+ 37	Oklahoma
Texas	5,966	6,381	2,636	5,421	19,201	84,385	41,775	53,769	50,719	79,708	155,899	114,354	270,253	150,133	+ 80	Texas
Montana	242	.....	249	438	2,423	920	.....	1,907	1,752	2,363	2,627	5,304	7,931	7,866	+ 1	Montana
Wyoming	.....	440	207	.....	1,880	.....	.....	569	1,260	1,031	1,238	3,118	4,356	5,888	– 26	Wyoming
Colorado	120	343	.....	69	457	1,856	1,978	3,225	2,857	4,918	5,643	5,262	10,905	10,083	+ 8	Colorado
New Mexico	278	.....	236	763	1,804	1,770	.....	5,492	5,257	11,444	2,474	13,126	15,600	11,099	+ 41	New Mexico
West of Miss.	**11,821**	**8,446**	**11,759**	**11,706**	**58,757**	**126,372**	**58,773**	**113,885**	**96,987**	**156,850**	**244,650**	**253,856**	**498,506**	**337,920**	**+ 48**	**West of Miss.**
Idaho	.....	76	.....	461	1,067	3,847	.....	736	2,038	1,523	5,530	2,695	8,225	10,296	– 20	Idaho
Utah	166	118	192	.....	669	1,544	2,150	1,680	1,686	3,648	3,933	4,272	8,205	20,154	– 59	Utah
Arizona	.....	.....	.....	1,071	486	195	.....	243	3,899	5,166	245	5,654	5,899	10,718	– 45	Arizona
Nevada	.....	.....	.....	2,606	278	208	1,500	7,061	5,099	12,256	4,198	12,554	16,752	6,478	+159	Nevada
Washington	1,602	573	1,124	1,437	6,356	9,061	5,530	27,788	11,393	37,855	16,988	47,876	64,864	54,102	+ 20	Washington
Oregon	1,604	176	878	1,798	2,716	8,953	1,625	7,877	3,844	12,182	12,018	17,453	29,471	26,961	+ 9	Oregon
California	16,501	6,215	8,296	14,659	12,124	64,885	97,184	82,645	91,141	196,047	171,350	222,291	393,650	458,477	– 14	California
Far West	**19,873**	**7,158**	**10,490**	**22,037**	**23,696**	**88,693**	**107,989**	**128,030**	**119,100**	**268,677**	**214,271**	**312,795**	**527,066**	**587,186**	**– 10**	**Far West**
U. S. 1945 (52 weeks)	61,039	34,560	53,080	56,750	227,258	635,170	387,273	462,909	371,360	750,000	1,144,384	1,145,824	2,289,408	.....	.....	U. S. 1945 (52 weeks
U. S. 1944 (52 weeks)	33,304	31,979	16,566	64,058	195,716	174,314	140,418	657,539	415,859	1,118,613	363,624	1,366,129	.....	1,729,753	.....	U. S. 1944 (52 weeks
% Change '44 to 45	+83	+8	+220	–11	+16	+264	+176	–30	–11	–33	+215	–16	.....	.....	+ 32	% Change '44 to 45
Canada, 1945	6,987	3,350	1,910	2,241	18,162	50,256	19,151	54,879	7,825	.....	73,755	90,306	164,061	.....	+ 49	Canada, 1945
Canada, 1944	1,855	1,001	1,547	394	7,875	35,446	10,804	27,211	23,626	.....	51,492	58,267	.....	109,759	.....	Canada, 1944

ENR-REPORTED CONSTRUCTION VOLUME—BY CLASS OF WORK



In the other classifications of construction, bridges lead with $53,080,000 or a 220 percent increase over the total for 1944. Other increases are recorded by waterworks, 83 percent; highways, 16 percent; and sewerage 8 percent. Earthwork and drainage dropped 11 percent below 1944.

GEOGRAPHICAL DISTRIBUTION

Geographically, five of the six sections report higher volumes in 1945 than in the preceding year. The Far Western states with a $527,066,000 volume dropped 10 percent below the total for 1944. Middle Western states with $429,100,000, 106 percent greater than the 1944 year led the sections reporting gains, with New England, $98,998,000, close behind with a gain over the preceding year. Middle Atlantic states with a $428,900,000 volume increased 61 percent over 1944 and states West of the Mississippi, $498,506,000, increased 48 percent. Southern states with $306,838,000 established a 10 percent gain over 1944.

In 1945, 23 percent of the reported engineering total was in the Far Western states, the third consecutive year that this region led the nation in volume of new construction started. States West of the Mississippi formed 22 percent of the total while the Middle Atlantic states and Middle West states each contributed 19 percent of the nation's total. The Southern states' share of the total was 13 percent. New England provided 4 per cent of 1945 reported engineering construction.

BUILDING ESTIMATES

Preliminary estimates of building permit volume in 257 identical cities indicate a total of $1,150,000,000 for 1945, 60 percent greater than the $720,343,000 reported by the Bureau of Labor Statistics in 1944. Of the 1945 total, $480,000,000 was for new non-residen-

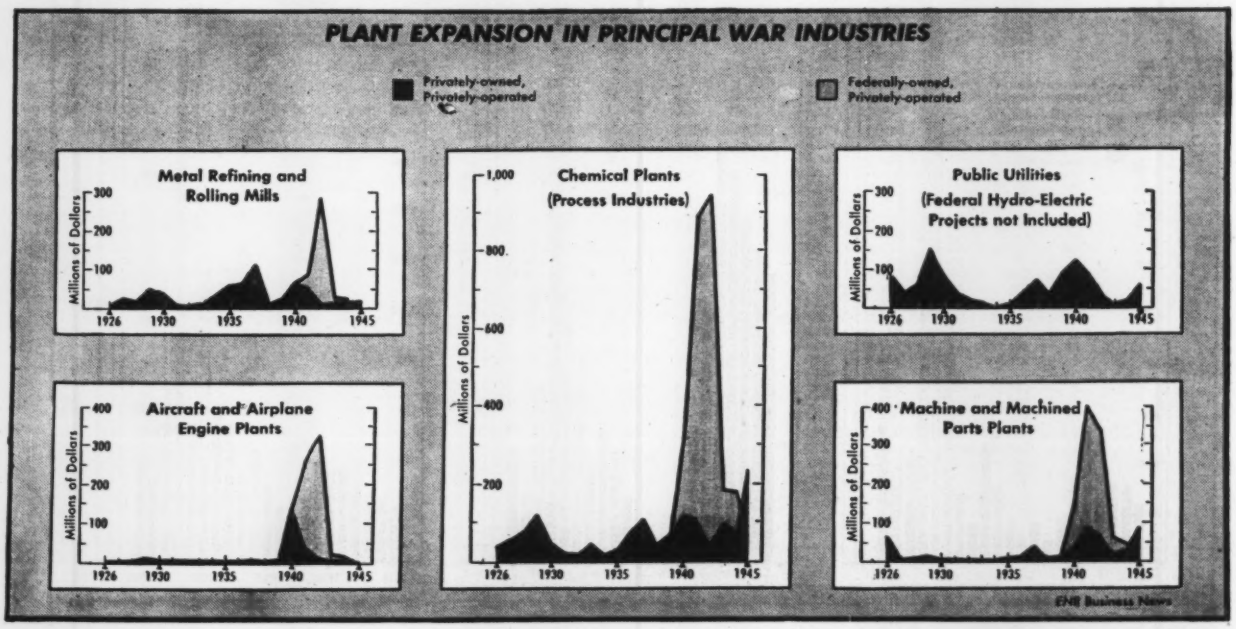
IV—CONTRACTS FOR INDUSTRIAL BUILDING CONSTRUCTION BY INDUSTRIES

(Federally-owned privately-operated plants added to private construction 1942-45)

(Value in Thousands of Dollars, ENR Reports)

	1942			1943			1944			1945		
	Pvt. Own.	Fed. Own	Total	Pvt. Own.	Fed. Own.	Total	Pvt. Own.	Fed. Own.	Total	Pvt. Own.	Fed. Own.	Tota
Transportation Service												
1. Railroads	$2,473	.....	$2,473	$3,180	.....	$3,180	$5,488	.....	$5,488	$10,961	.....	$10,961
2. Automotive	1,733	.....	1,733	1,029	.....	1,029	2,225	.....	2,225	15,512	.....	15,512
Public Utilities	29,225	.....	29,225	6,555	$300	6,855	14,769	.....	14,769	52,150	.....	52,150
Process Industries (a)	42,263	$902,206	944,469	104,024	82,201	186,225	75,376	$108,453	183,829	245,129	$61,675	306,804
Food Industries (b)	9,544	500	10,044	9,134	.....	9,134	11,080	1,229	12,309	64,688	.....	64,688
Metal Refining and Rolling	9,217	272,325	281,542	13,875	11,409	25,284	17,439	3,617	21,056	18,218	.....	18,218
Metal Working Plants												
1. Auto Factories	530	.....	530	210	200	410	540	.....	540	41,790	.....	41,790
2. Aircraft Factories	16,687	314,688	331,375	1,406	20,045	21,451	4,052	8,162	12,214	3,848	2,825	6,673
3. Foundries	6,629	22,991	29,620	1,368	3,360	4,728	2,861	2,680	5,541	2,333	1,040	3,373
4. Mach. and Mach. Parts	62,338	272,349	334,687	16,631	42,312	58,943	27,820	16,652	44,472	86,970	7,569	94,539
Radio	2,300	1,000	3,300	498	40	538	167	.....	167	7,540	.....	7,540
Textiles (Excluding rayon)	366	.....	366	320	.....	320	823	.....	823	6,840	.....	6,840
Wood Industries	700	.....	700	1,049	.....	1,049	517	.....	517	8,592	.....	8,592
Miscellaneous												
1. General Factories	15,729	123	15,852	6,825	255	7,080	9,039	90	9,129	65,742	290	66,032
2. Refrigeration and Cold Storage	585	.....	585	730	.....	730	2,118	.....	2,118	4,857	.....	4,857
Total	$200,319	$1,786,182	$1,986,501	$166,834	$160,122	$326,956	$174,314	$140,883	$315,197	$635,170	$73,399	$708,569

(a) Includes distilleries. (b) Includes breweries and wineries.


PLANT EXPANSION IN PRINCIPAL WAR INDUSTRIES
Privately-owned, Privately-operated
Federally-owned, Privately-operated
Metal Refining and Rolling Mills
Chemical Plants (Process Industries)
Public Utilities (Federal Hydro-Electric Projects not Included)
Aircraft and Airplane Engine Plants
Machine and Machined Parts Plants
Millions of Dollars
1926 1930 1935 1940 1945
ENR Business News

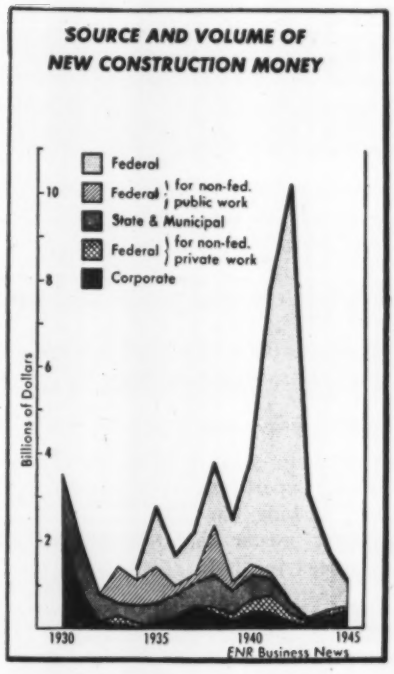
tial buildings, $330,000,000 for residential buildings and $340,000,000 for additions, alterations and repairs to existing structures.

Non-farm dwelling units provided in United States will total approximately 244,600 in 1945 according to early Bureau of Labor Statistics figures. This total will be 45 percent greater than the 169,000 structures provided in 1944. Of the 1945 total 218,400 were one-family units, 9,900 were two-family units and 16,300 were multi-family units.

FHA mortgages selected for appraisal, or mortgage applications received, are valued at $727,000,000 for 1945. Of this total, $611,000,000 is for title II or non-war home building and alterations, a 74 percent increase over the 1944 figure. Title VI, or war housing, $116,000,000, dropped 63 percent below the preceding years, $315,800,000.

Residential building costs climbed approximately 3 percent higher in 1945. The Federal Home Loan Bank Board reported its average residential building cost index at 137.2 in November 1945 while the ten month average for 1944 was 132.5.

New capital made available in 1945 for civil engineering construction purposes totalled $1,824,026,000, consisting of $1,213,498,000 from public and federal funds, $409,202,000 in state and municipal bond sales and $201,326,000 in corporate security issues. In 1945 new capital for construction purposes and its components reestablished themselves at peacetime levels for the first time in five years. Of the 1945 total $1,213,498,000 or 67 percent was contributed by Federal and public sources, with state and municipal bond sales making up 22 percent and corporate securities, 11 percent. This is comparable with the last peace time year of 1940 when public and federal sources contributed 63 percent of the total new capital, and state and mu-



V—NEW CONSTRUCTION CAPITAL

(Millions of Dollars)

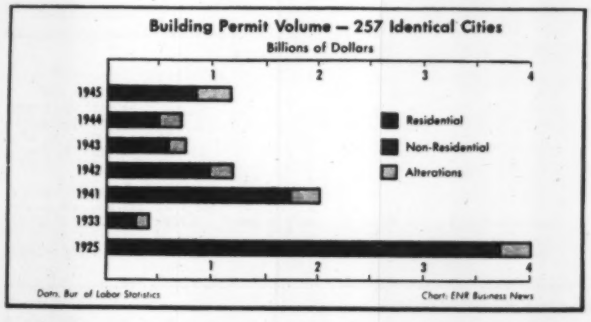
	Corporate	State and Municipal	Federal	Total
1925	$1,966	$1,352	.....	$3,318
1926	1,824	1,344	.....	3,168
1927	1,784	1,475	.....	3,259
1928	1,568	1,379	.....	2,947
1929	1,758	1,418	.....	3,176
1930	2,032	1,434	.....	3,466
1931	787	1,235	.....	2,022
1932	159	561	.....	720
1933	292	1,091‡	.....	1,383
1934	77†	1,011‡	194	1,282
1935	47†	1,337‡	1,354	2,738
1936	251	698	691	1,640
1937	518†	738‡	946	2,202
1938	457†	1,902‡	1,345	3,704
1939	304†	783‡	1,318	2,405
1940	624†	805‡	2,466	3,895
1941	741†	477‡	6,677	7,895
1942	332†	225‡	9,662	10,219
1943	56†	135‡	2,882	3,073
1944	194†	193‡	1,327	1,714
1945	286†	409‡	1,129	1,824

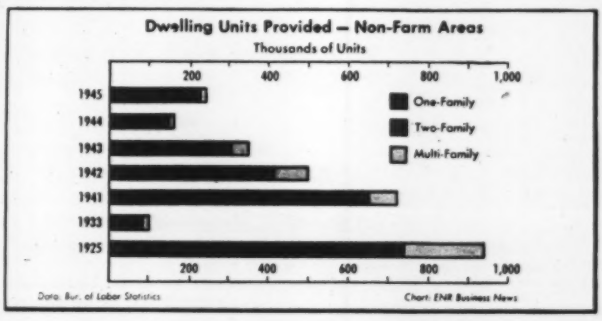
Note:—Federal appropriations include federal aid highway, WPA, and regular departmental appropriations for construction.

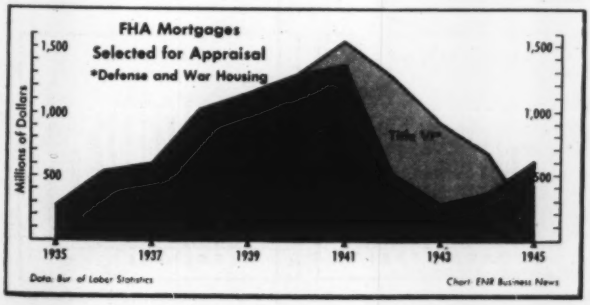
† Includes $237,000,000 RFC and PWA loans '33; $55,000,000, '34; $9,000,000, '35; $807,000, '37; $76,106,000 REA, $4,500,000 RFC loans, '38; $89,000,000 REA and $400,000 RFC loans, '39; $40,000,000 REA and $193,000,000 in RFC loans '40; $100,500,000 in REA and $282,000,000 in RFC loans in '41; $149,800,000 in RFC in '42; $20,000,000 in REA and $14,030,000 in RFC in '43; $20,000,000 in REA and $61,440,000 in RFC loans in '44; $60,000,000 in REA and $24,400,000 in RFC loans in '45.

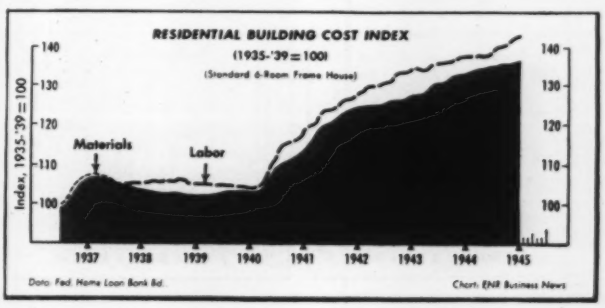
‡ Includes $814,000,000 RFC and PWA loans and grants '33; $580,000,000, '34; $808,000,000, '35; $164,700,000, '36; $207,000,000, '37; $723,265,000 PWA, $99,844,000 RFC, $320,986,000 USHA loans, '38; $216,000,000 in USHA loans, '39; $219,000,000 USHA, $5,000,000 RFC loans in '40; $30,000,000 in USHA, $6,900,000 in RFC loans in '41; $7,655,000 in RFC loans in '42; $3,133,000 in FPHA and $1,015,000 RFC loans in '43; $500,000 in RFC loans in '44; $200,000 in RFC loans in '45.

RESIDENTIAL BUILDING STATISTICS









nicipal and corporate securities, 20 and 16 percent respectively. The war years in between saw federal funds constitute 85 percent of new capital in 1941; the record 95 percent in 1942; 94 percent in 1943 and 82 percent in 1944. As the federal funds soared to finance the war effort the corporate security issues and state and municipal bond sales dropped to all time lows. In 1943 state and municipal financing was only 4 percent of the nation's total capital for construction, and corporate securities contributed but 2 percent. By the end of 1944 state and municipal bond sales had increased to 11 percent of the total while corporate securities went up to 6 percent.

The federal financing total for 1945 included $24,600,000 in RFC loans, $79,000,000 federal-aid-highway program; a $60,000,000 REA loan and $1,049,898,000 for regular federal departmental appropriations for construction.

MATERIAL SHIPMENTS

Shipments of fabricated structural steel for bridges and building construction are estimated at 743,000 tons in 1945, based on preliminary American Institute of Steel Construction statistics. This estimate is 24 percent greater than the 598,000 tons estimated in 1944.

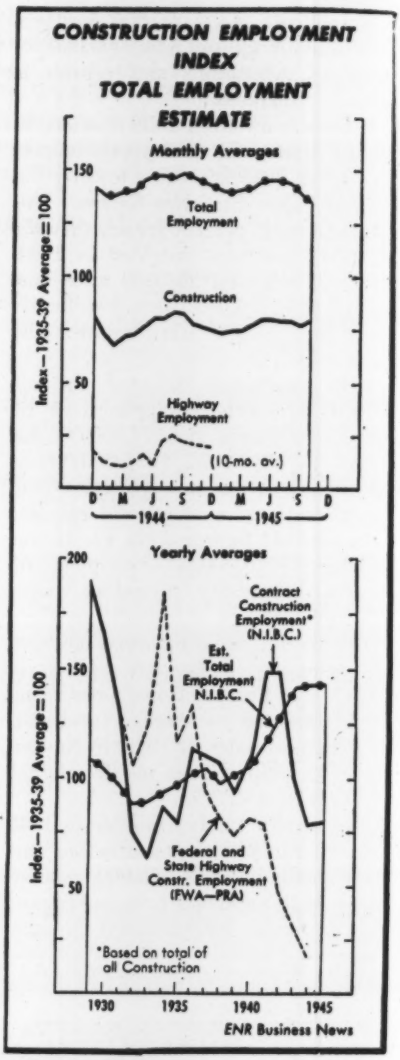
Portland cement shipments with an estimated 12-month average of 8,950,000 barrels per month totaled 107,400,000 barrels for the year and is 14 percent greater than the estimated 94,234,000 barrels shipped in 1944 according to U. S. Bureau of Mines reports.

It is estimated that shipments of all types of lumber will total 27 billions board feet in 1945, a volume 13 percent below the 30.5 billions board feet reported last year by the National Lumber Manufacturers Association. The 1945 estimated total is the lowest reported in five years and is due largely to the nationwide shortage of this construction material.

Asphalt production is expected to total 7,231,000 short tons in 1945 according to estimates based on ten-month Department of Commerce figures, making the 1945 production 7 percent greater than the production estimated for 1944.

EMPLOYMENT AND MATERIALS

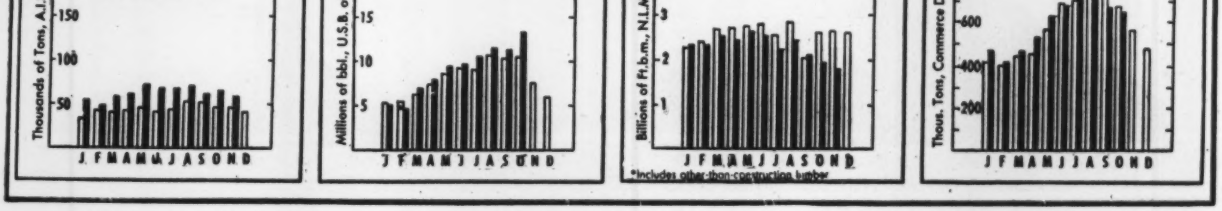
Construction employment estimates averaged 1,367,600 workers per month for the first 10 months of 1945, a 3 percent increase over the 1,329,000 men reported as an average for a like period of 1944 by the National Industrial Conference board. The 1945 average can be compared with the depression low of 884,000 in April, 1933 and the all-time high of 2,952,000 in August 1942. These estimates by the N.I.C.B. include only construction employment at the project site, and are exclusive of force account workers, and workers engaged in offsite prefabrication.



VI—OUTPUT OF VARIOUS CONSTRUCTION MATERIALS FOR TEN-YEAR PERIOD

Item	Basis	Unit	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945
Lumber	Shipments	Millions Bd. Ft.	24,283	24,988	22,201	25,811	30,095	34,086	38,946	35,852	31,977	21,377(1)
Cement	Shipments	Thous. Bbl.	112,850	113,805	106,324	122,651	130,350	167,508	185,267†	127,632	94,272	100,298†*
Cement	Production	% Capacity	44.1	45.5	41.2	47.7†	51.2†	65.3†	74.0†	54.0†	31.9	42.0
Steel Ingots	Production	Thous. Net Tons	52,425	55,443	31,071	51,585	66,982	82,837	86,030	88,836	89,642	79,746
Steel Ingots	Production	% Capacity	68.4	72.4	39.7	64.7	82.1	97.3	96.8	98.1	95.5	83.5
Fabricated Structural Steel	Shipments	Thous. Tons	1,548	1,661	1,159	1,440	1,516	2,251	2,040	‡	‡	‡
Fabr. Str. Steel—Bridge & Bldg.	Shipments	Thous. Tons	.....	.....	.....	.....	.....	.....	1,678	832	598	687(3)
Explosives	Shipments	Thous. lb.	378,361	387,805	320,259	372,470	406,671	460,075	427,744	451,773	447,100	405,463(3)
Asphalt	Production	Thous. Short Tons	3,869	4,182	4,341	4,954	5,347	6,558	6,296	6,758	6,996	6,071(2)

†* Includes Puerto Rico and Hawaii* from May through November. (1) Nine months' total. (2) Ten months' total. (3) Eleven months' total. ‡ A.I.S.C. estimated shipment data for entire industry discontinued.

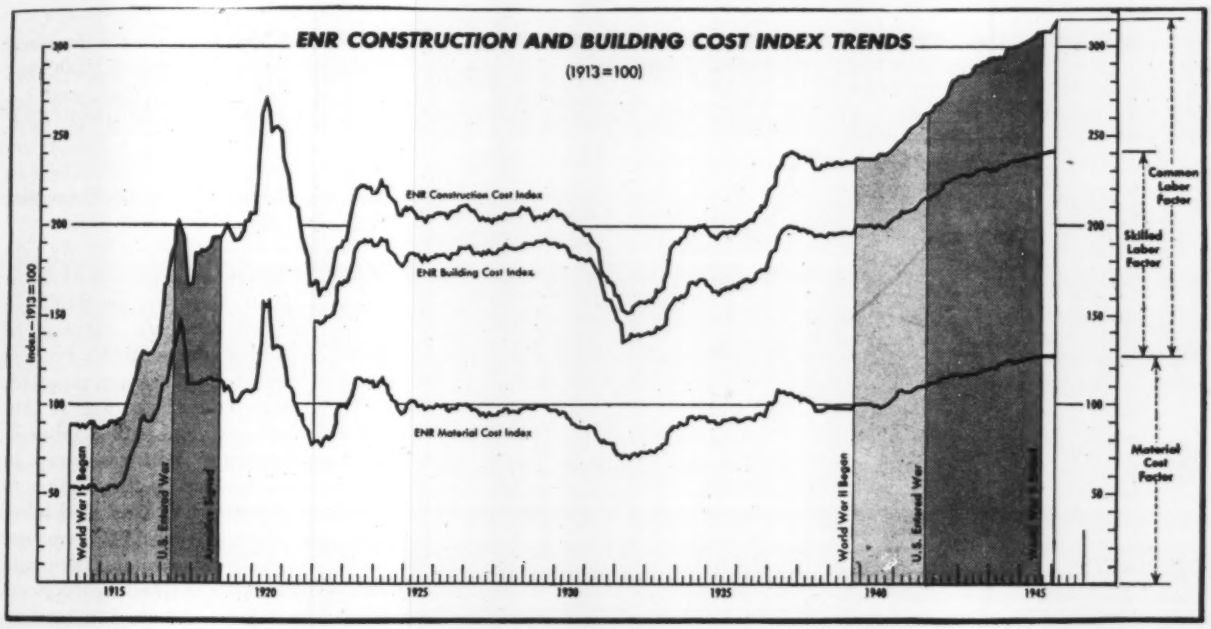


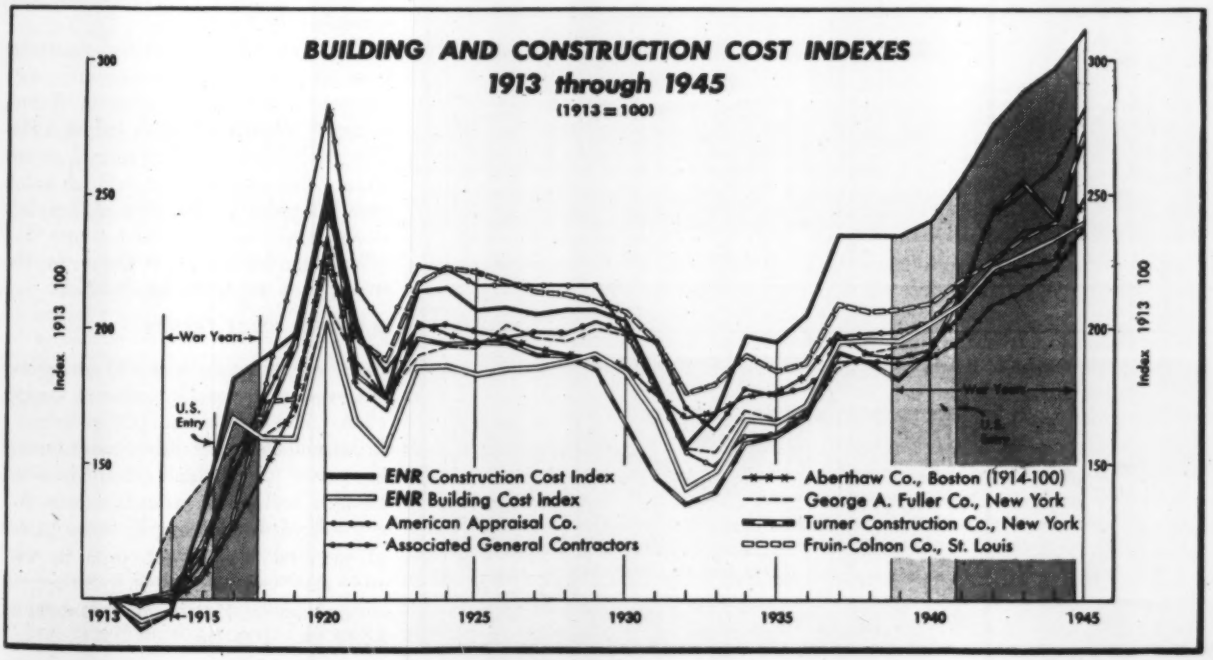
CONSTRUCTION AND BUILDING COSTS INDEXES

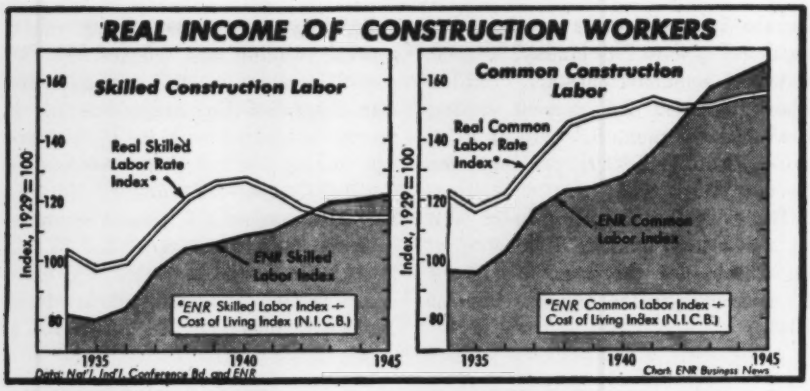
The rise in construction costs continued in 1945 exceeding the former all-time average of 1944, 299 by 3 percent as measured by the *ENR* Construction Cost index. This index of material and labor costs opened 1945 at 302.50 and in climbing to 313.48 in December, set a year average of 307.74. Common and skilled labor wage rate increases were responsible for the increased costs as the OPA regulated prices for lumber, cement and steel remained constant. Skilled labor increased 2.4 percent during 1945 and common, 5.3 percent averaging $1.66 and $0.91 per hour for the year, respectively.

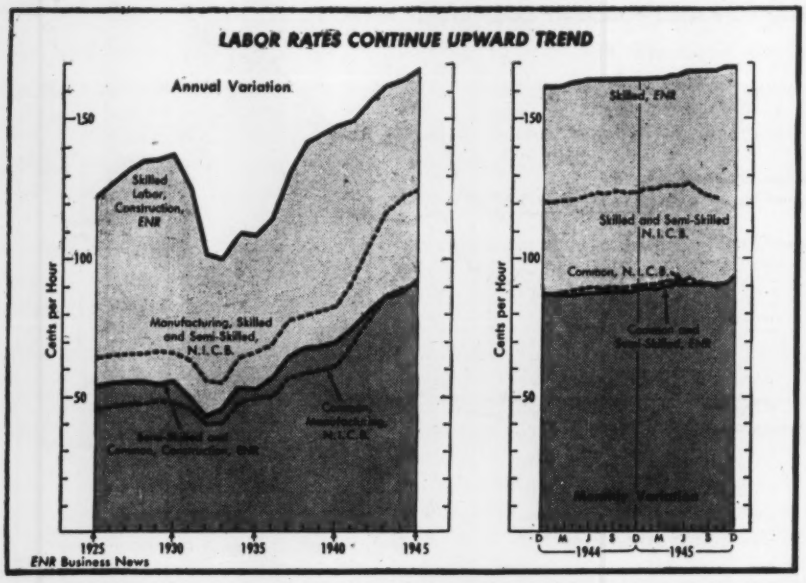
The *ENR* Building Cost Index also set a new high mark in 1945, averaging 239.14 for the year, a gain of 1.7 percent over the previous high of 1944.

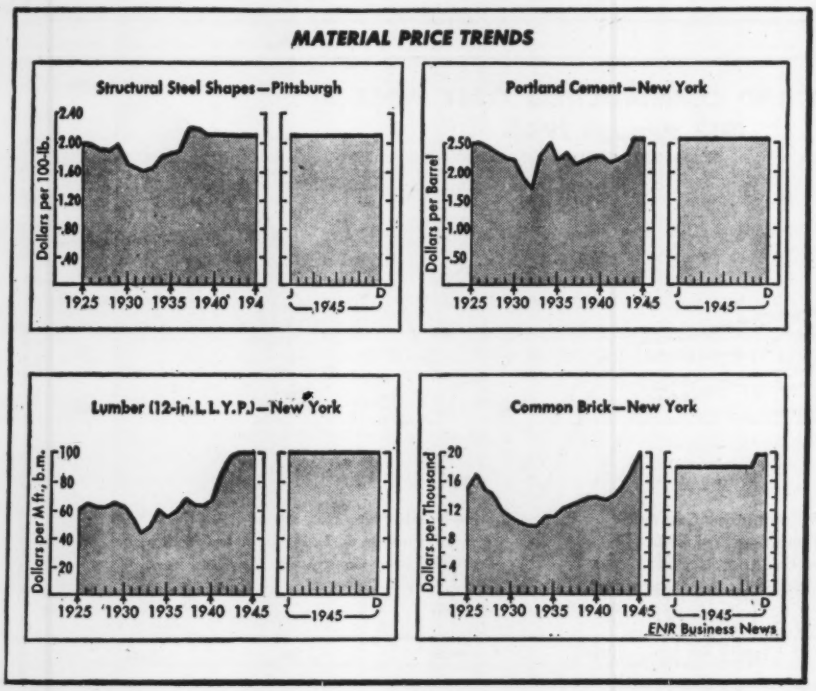
Building costs measured by other general building cost indexes also reported increases in 1945. The American Appraisal Co. index was up 4 percent compared with its 1944 average, ending 1945 at 282. Associated General Contractors' index in November, 238, marked a 6 percent increase over the month last year; the E. H. Boeckh Co. index for brick and concrete factory construction in New York City averaged 294 for 1945, a






REAL INCOME OF CONSTRUCTION WORKERS
Skilled Construction Labor
Real Skilled Labor Rate Index*
ENR Skilled Labor Index
*ENR Skilled Labor Index ÷ Cost of Living Index (N.I.C.B.)
Index, 1929=100
Common Construction Labor
Real Common Labor Rate Index*
ENR Common Labor Index
*ENR Common Labor Index ÷ Cost of Living Index (N.I.C.B.)
1935
1940
1945
Data: Nat'l. Ind'l. Conference Bd. and ENR
Chart: ENR Business News





3.5 percent increase over the 1944 average of 284.

Contractors cost indexes which include management and labor efficiency cost factors in addition to labor rates and material prices, all reported strong gains in 1945 over the preceding year. The Austin Co. index average for 1945, 234, rose 5 percent over the 1944 average; and the Aberthaw Co. index, 236, rose 4 percent; the Turner Index, with an average of 263, was 8 percent over 1944.

LABOR RATES

Common labor hourly rates for construction workers averaged 91.0¢ per hour in 1945, a record high, and 3.5 percent higher than the 1944 *ENR* 20-cities average. The common average in January 1945 was 89.1¢ and rose steadily to the record December high of 93.8¢.

The skilled construction hourly rate of *ENR* 20-cities average was $1.64 in January 1945 and rose to $1.68 in December for a year's average of $1.66, 2 percent above 1944's average and the highest *ENR* average reported.

The sudden end of the war in August, saw common and skilled labor in 26 manufacturing industries drop in hourly earnings due to the decline in overtime and bonuses. Unskilled labor earnings, 93.1¢ in June 1945 averaged 91.6¢ for the year, while skilled and semi-skilled labor, $1.268 in June averaged $1.252 for the year, according to ten-month statistics reported and compiled by N.I.C.B.

The real income of skilled construction workers, which takes into consideration changes in cost of living, dropped slightly in 1945 below 1944. The skilled labor index rose 2 points during the year and the cost of living rose 1.8 points. The rise of 5 points in the common labor index more than offset the 1.8 point increase in the living cost reported by N.I.C.B.

MATERIAL PRICE TRENDS

Basic construction material price averages were generally constant during 1945. The OPA authorized price rises in structural clay tile, manufacturing prices for portland cement in some western and south western states and a 9.7 percent increase in sales prices of vitrified clay sewer pipe in east and east central states. Structural steel shapes at Pittsburgh remained at $2.10 per 100 lbs.

Impoverished Europe Faces Slow Comeback

Maj. Gen. Philip B. Fleming
Administrator, Federal Works Agency
Washington, D. C.

***Contents in Brief**—As perhaps the only American visitor to Europe during the war whose sole interest was civilian public works and reconstruction, General Fleming speaks with unique authority on conditions from Russia through Scandinavia to France and Italy. Russia is most aggressive in both planning and building, but lacks construction equipment. Nevertheless the rebuilding of the cities such as Stalingrad moves ahead. Western Europe has plans, but lacks coal to get her transport and industries running. Until it has food, clothing and shelter, little construction can be undertaken. Prefabrication of houses, electrification of railroads dominate thinking in Norway and Sweden.*

WAR DESTRUCTION throughout Europe was so extensive that, in my opinion, little in the way of new construction can be expected in 1946. For many months to come Europe will be concentrating on the task of clearing away the rubble, sheltering the homeless, making temporary repairs, and getting back into operation power plants, transportation facilities, water plants and sewer systems.

While the laborers clean away the rubble, however, architects and engineers are busy with plans for a new and better Europe. As might be expected, Russia, with its closely controlled economy, is farther advanced with its planning than any other country.

Twice within a year I visited Europe, touring Russia, the Scandinavian countries, the Low Countries, France, Germany and Italy, as well as North Africa and Iran. I talked to the principal ministers of state in charge of reconstruction activities, to engineers and architects. All of them were busy with plans for the future, but few had projects actually under way. The fact that our Army Transport Command placed an airplane at my disposal in Western Europe, and the Soviet Government in Russia, made it possible for me to cover a great deal of territory quickly and conveniently.

Nowhere were any restraints placed upon my activities, and even in Russia I was given every facility to see whatever I wanted to see and to make any inquiries that occurred to me. I was the first non-Russian permitted to visit the Ukraine after the Germans had been driven out. I got frank answers to my questions, and there were no specially conducted tours, so far as I could see, in an effort to foreclose my judgment.

I visited Russia in the summer of 1944. Of course, I can report only on the situation as I found it then, and undoubtedly conditions are now changed somewhat. I spent a good deal of time in Moscow, visited Stalingrad, Leningrad, Zaporozhe, site of the great Dnieper Dam, Stalino, and various other cities.

Reconstruction projects

Contruction actually under way included the rebuilding of the Dnieper Dam, and hydroelectric station and their appurtenant works; the rebuilding of Stalingrad, on which an ambitious start had been made; the reconstruction of villages in the vicinity of Moscow which had been demolished by the Germans; highway repairs and repairs to the Moscow-Leningrad railway, which had been badly damaged.

The war was still in progress. Since the Russians were living up to their slogan, "Everything for the Front," very little in the way of labor and materials could be spared for reconstruction or new civilian works. The labor force was composed very largely of women, supplemented by a few old men and children, the younger men being at the front. Women were doing the hardest kind of back-breaking work, such as laying railroad track, but a very large number of them also were professionally engaged as architects, engineers and technicians.

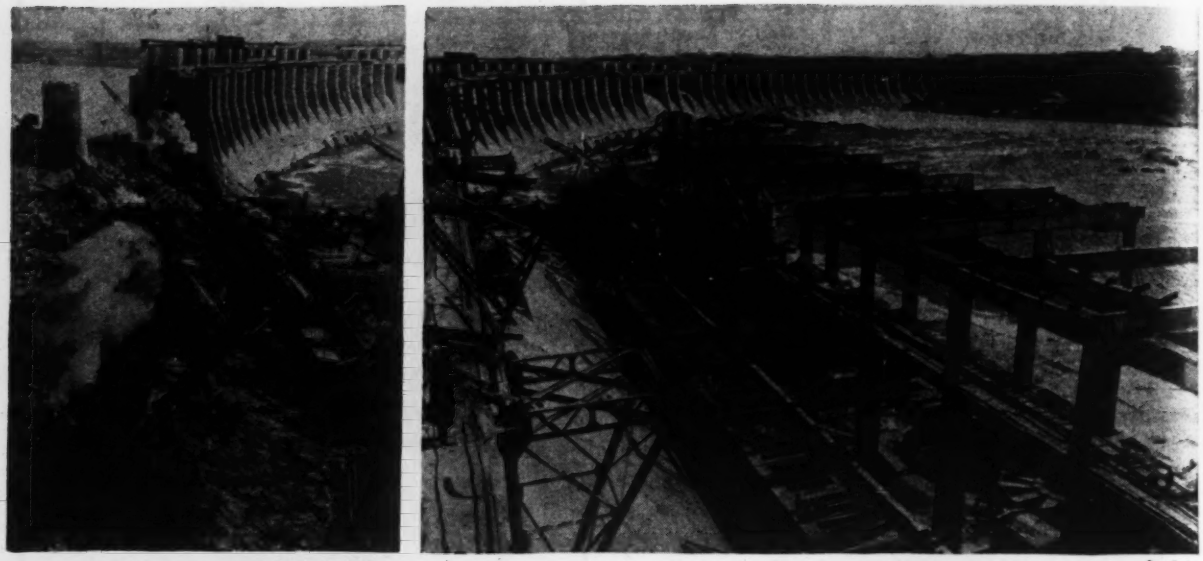
As might be expected, there was everywhere a tragic shortage of tools and equipment, since the Germans had stolen everything of value that was movable, and had destroyed what they could not remove, including thousands of tractors, trucks, and even wheelbarrows.

The work at the Dnieper Dam is fairly representative. As readers of *Engineering News-Record* are well aware, the Dnieper dam was largely the creation of Col. Hugh Cooper and his brother Dexter, and most of the Russian engineers now at work on the reconstruction were associated with the Coopers in the original construction. Hugh Cooper remains today an almost legendary figure in the surrounding country. Also some of the original installations were of American manufacture, including five of the nine generators.

The extent of the war damage to the dam is fairly well known by this time. Suffice it to say that the power house was completely demolished, with the masonry work of the dam itself proving a somewhat harder nut for the German demolition engineers to crack—although even it was damaged extensively. All the appurtenant buildings, plants and workshops essential in the normal operation of the dam, as well as homes of workers, restaurants, and other facilities, were shattered.

I. Kandalov, an old Cooper associate, is director of Dnieperostroi, the building trust in charge of reconstruction operations. The labor force consisted of 8,000 persons, almost all unskilled, 65 percent of whom were women recruited from the ranks of housewives, domestic servants and from the neighboring collective farms. A few technicians, who had been released from the Red Army for the purpose, were also at work.

Rubble was being removed—all by hand labor. Women were lifting great



Sovfoto

Fig. 1. Russia pushes reconstruction of Dnieper Dam, wrecked by German. Top left: Forms for penstock leading to power house being built in front of rubble barrier thrown up to hold back water of reservoir until the forebay dam can be rebuilt. Top right: Wrecked power house which is being restored to original condition shown in picture at left below.

chunks of concrete and dumping them in trucks. A few Russian machine tools were in use, as well as some other nondescript units assembled from all sorts of odd parts. Six or eight American-made machines were in evidence.

Workers are paid on the average of 17 rubles for an eleven-hour day—three hours a day more than German prisoners were being worked—and a bread ration of 600 grams a day. Extra rations were given to workers who exceeded the established work norm. Workers could eat in a restaurant operated by the management or, if they wished to take their meals at home, they could obtain food supplies at the state store.

Mr. Kandalov has established an ambitious work schedule which called for the installation of the first generator, starting in December, 1945. Reconstruction was to be completed by the spring of 1947, at which time, presumably, the dam and hydro-electric station would again be supplying the power needs of Zaporozhe, Dnepropetrovsk, Krivoi Rog, Nikopol, and other communities.

This is a sketchy account of only one phase of Russian reconstruction which involves the whole economy. The Soviet Union, of course, has carried social and economic planning to the extreme, and individual projects must be tailored to fit into the general, overall programs which have been drawn up for the future cultural and economic development of the Soviet Union. Most of these plans, incidentally, are not new. They are not post-war plans, but were in existence before the war. The German invasion of June, 1941, arrested civilian construction, but as the war in Europe neared its end the plans were again brought forward, dusted off, refurbished, and again put into execution.

City planning, nationally supervised

Perhaps the most significant of Russia's domestic programs is the Gosplan, which prescribes the future economic development of the country. It is Gosplan that decides where factories shall be built, how many workers they shall employ, what they are to produce, and in what quantities. Even the size of cities is prescribed, the maximum limit for Moscow being 5,000,000 and of Leningrad 3,500,000. Stalingrad, which before the war had 600,000 persons, is to be reduced to 450,000.

The Committee on Architectural Affairs, which reports to the Council of Peoples' Commissars, was created in September, 1943, to raise standards of architecture throughout the country and to solve the tremendous problems arising from war destruction, and has supervision over all city planning. A hundred and forty municipalities were destroyed, including 70 major cities, to say nothing of hundreds of small towns and villages. The committee, which is headed by A. G. Mordvinov and employs at least a thousand architects and engineers, was devoting principal attention to replanning the 70 large cities. It is responsible for design only, actual construction being carried out by the Commissariat for Construction.

For each city a complex planning "brigade" is set up, headed by an architect and including in its membership engineers, economists, experts on transportation, sanitation, health, recreation, education and so on. The brigade is responsible for the development of the master city plan, subject to the

approval of Mr. Mordvinov's committee, and while the task is of enormous proportions, the work is simplified in some degree by the fact that the brigade knows exactly what it has to provide for in the way of population, industry and transport. Each city will be rebuilt on a plan which will take into account its historical growth and background; good elements of the old city must be retained, while the undesirable is to be eliminated.

Stalingrad to rise again

The Stalingrad scheme may be cited as fairly typical. Head of the Stalingrad brigade is K. S. Alabyan, who is well known to American architects as co-designer, with B. M. Yofan, of the Russian pavillion at the New York Worlds Fair. (Mr. Yofan, incidentally, heads the brigade for Novorossisk.) Stalingrad was so thoroughly destroyed that almost nothing remains worthy of preservation. The slate has been wiped clean for a fresh start, and no architect or engineer could ask for a more challenging or interesting assignment. It is a planner's paradise.

By virtue of the Gosplan, Mr. Alabyan knows, of course, how large his city is to be, and the exact contribution to the Russian economy expected of it. Some indication of the scope of his authority is the fact that the state trust operating an oil refinery in Stalingrad wanted to rebuild on its old site. It was overruled by Alabyan on health and esthetic grounds, and he was upheld by Moscow in assigning another location.

The city will stretch 50 kilometers along the Volga, trees are to be planted everywhere and the whole city will be surrounded by a greenbelt of trees which will serve the incidental purpose of controlling the dust storms from the steppes. There will be a "poberezhe," or a system of parks and boulevards, along the Volga. What remains of the old trolley system will be completely scrapped as the Russians consider the electric street car obsolete. Transportation will be provided by a high-speed electric railroad running the length of the city, with auto busses serving as feeders.

Multistory buildings will be located in the center of the city—the downtown "business section"—and will be surrounded by a zone of two and three story dwellings and apartment houses which, in turn, will be surrounded by one-story one- and two-family houses, so that the profile of the city will be pyramidal, sloping down from the center to the outskirts.

The Russians love their native soil, and gardening is a national enthusiasm. Every home, therefore, will have space for lawns, vegetables and flowers.

An individual workman may build his own home, aided by a government loan of 10,000 rubles, and will be given technical assistance by the factory that employs him. At the time of my visit 20,000 home plots in Stalingrad already had been assigned. All homes are to be heated from central stations. Excess heat from industrial plants will be used, so far as possible, supplemented to the necessary extent by coal, oil, or natural gas, of which there are believed to be large supplies beneath the city.

The construction workers were being housed in trailers and tents, an idea apparently borrowed from the United States, and Mr. Alabyan also expressed great interest in American methods of prefabrication. Principal basic materials for home construction are wood, brick, plywood, cinder block (waterproofed with a 5 percent lime paint), and gypsum. Now materials, such as plastics, may be important in industrial construction, but not in homes.

Living space before the war averaged about six square meters per person. The immediate postwar goal is nine square meters per person, and the ultimate goal twelve. It should be noted, however, that certain classes—including engineers, technicians, generals of the army, and artists—are granted more space than the average.

Apartment units have been standardized, although variations in roof lines, colors and interior decoration are intended to relieve the monotony. It was interesting to note that some of the models shown harked back to the best in Russian handicraft in shutters, doors, window sills and tops.

Streets, of course, are to be wide—up to 100 ft. Underground facilities still existing are to be used as far as possible, but they are technically poor and for the most part will be replaced. Sewage will be used to irrigate land before it reaches the river.

This is an all-too-brief account of the Stalingrad project, but it may be at least suggestive. In any event, the same scheme is to be applied to all Russian cities, including Moscow itself—which suffered relatively little war damage—with appropriate variations.

Scandinavia has plans too

No other country in Europe has such ambitious plans as Russia. All of them, however, are developing programs for future construction, and housing everywhere is first on the list. Not only were millions of homes destroyed by military action, but the suspension of normal building operations during the war would provide a five-year backlog of unmet need even

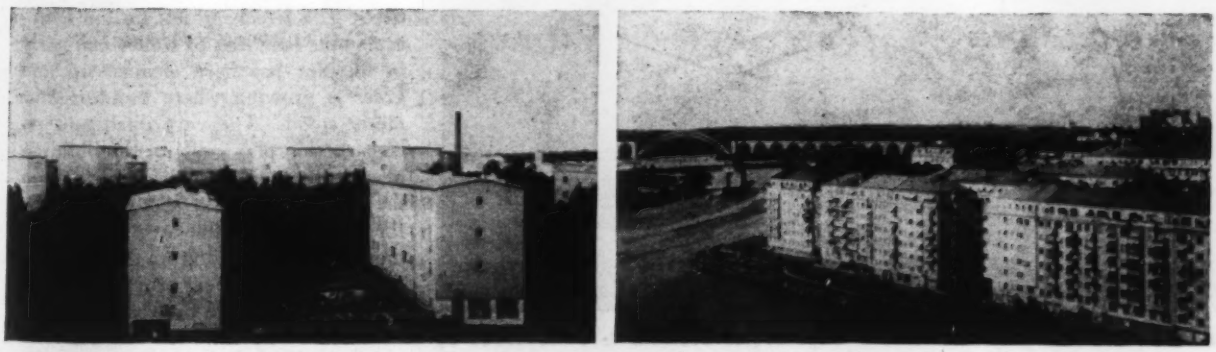


Fig. 2. Housing shortage is acute in Stockholm as elsewhere. At left is latest type of low-income group housing, built of yellow brick. Right picture is of upper-income apartments in neighborhood of Arsta bridge.

if there had been no destruction. This is true even of Sweden, which, neutral during the struggle, suffered no demolition. An interesting feature of Sweden's housing program is the development of prefabricated units by the government, which can be put together by the purchaser with a few simple tools, perhaps with a little help from his neighbor. He may call on the government for technical advice.

The coalition government, in power during the war, was dissolved last autumn and the Social Democrats are again in control. Their program calls for the nationalization of all railroads still remaining under private ownership, and for various anti-cyclical measures. A Swedish commission of 21 members had been busy for some time on postwar plans, and, strangely enough, every one of its recommendations was arrived at unanimously. A national investment council is proposed to coordinate the investment policies of private business with those of government, the better to carry out the national full-employment policy. Public works, national and local, are to be timed for periods of recession, and taxation policies intended to stimulate private business to make all possible capital improvements during a period of depression, already in effect, may be strengthened.

Norway and Denmark

Norway suffered much material damage in the war-torn province of Finnmark. Oslo and other seaports were slightly damaged by "precision" bombing. The cities and the countryside were gutted of moveable objects by the Germans during their five years of occupation. At the time of my visit the people were busy celebrating their liberation and seemed reluctant to return to work. The principal public work contemplated is the further electrification of the railroads, eighty per cent of which are still powered by coal. Coal was unobtainable during the war, and the new conception of national security calls for further extensive hydroelectric developments.

Denmark suffered little material damage except that caused by the pin-point bombing of such targets as Gestapo headquarters. The cities are still filled with heavy, concrete air-raid shelters, and while such structure were being removed in Norway, they are being retained in Denmark so that their removal later on can be made a sort of WPA "made-work" project if unemployment increases. Denmark, with an area a little larger than Maryland and with a population less than that of the Chicago metropolitan area, is predominantly agricultural and will probably remain so. Housing is needed, but there are few plans in existence for heavy engineering works.

Belgium improving its roads

Coming to the Low Countries, which were battlefields in 1940 and again in 1944 and '45, one finds war destruction on an appalling scale. Yet Belgium is well prepared with construction plans for which blueprints were drawn during the war, especially in the highway field. A far-reaching, long-time program of widening main roads in the country and through the cities is contemplated. The government has established along these highways building lines 200 ft. apart, to which new structures must conform. Incidentally, some of the V bombing of Antwerp contributed materially, if unwittingly, to the street-widening program by destroying formerly abutting structures.

Brussels was much less severely damaged. A big, boldly-conceived project halted by the war is a junction between the north and south railroad stations in Brussels, the distance between the two being so great as to hamper railroad traffic badly. It is now to be completed and I saw work in progress and it also was explained to me by maps and models. It is an expensive undertaking, but the Belgians feel that it will be a good investment in the long run.

Holland faces huge building job

The Hague was badly shattered, and thousands are homeless. Part of the destruction was carried out by the Germans for defensive purposes, as they expected an allied landing attempt there; part of it was wanton as the Nazis were driven out; and part of it was caused by V-2 bombs which, late in the war, were launched from platforms set up in the city streets. Many of the bombs fell so far short that they actually exploded in The Hague with a blast so terrific that tile roofs were shaken down and windows shattered within a mile radius.

Port facilities in Amsterdam and Rotterdam were demolished by the Germans in as thorough a manner as I have ever seen. It will be a long time before they will again be in operation. The wreckage left by the deliberate blitz-bombing of Rotterdam early in the war has been cleaned up and grass is growing where building formerly stood. The very intelligent reconstruction plan calls for the building of an entirely new business district on the site of the blitz, and people who formerly lived in the area will be removed to new housing on the outskirts of the city. Other projects in the Netherlands include the redemption of land flooded by the Germans, but land flooded with fresh water may actually have been improved for agricultural

Fig. 3. Better-class apartment house in Copenhagen, Denmark, is distinguished by balconies and glassed rooms which are sought also for low-income housing in a country where sunlight is at a premium.

purposes. There was less salt-water flooding than I had expected to find, but land so desolated will be barren for many years to come.

In brief, the problem for both Belgium and Holland is one of reconstruction rather than the undertaking of wholly new enterprises, although the occasion now presents itself for building better than in the past and for the correction of old defects.

Italy needs roads and housing

Such also are the problems and the opportunities presented in Italy. All bridges and culverts were demolished in the wake of the German retreat. Between Rome and Naples alone some 1,200 bridges were demolished. Railroads were back in partial operation, and bridges were being rebuilt of stone by primitive hand-labor methods.

Some good, sturdy new apartment houses were under construction mostly two-stories high, with stairways outside the buildings to conserve interior space. Apartments were of one, two and three rooms, with kitchen and bath.

I had heard much of the Italian autostadt, but actually there are probably not more than 30 miles of these modern high-speed highways scattered over the whole country. Other roads were winding, of poor alignment and low visibility, picturesque to travel over, but inadequate to meet modern traffic requirements.

Many cities were entirely destroyed, including Pontecorvo and Cassino. The latter is to be left a heap of rubble in mute testimony to the horrors of war, and the new Cassino is to rise on an entirely new site some distance away. Many of the homeless are being sheltered in so-called disaster housing—movable barracks-like structures of rather flimsy construction—which were maintained by the public works department for emergency use in a land frequently visited by hurricanes and earthquakes.

Bridges big French need

The famous French autoroads proved to be as much of a disappointment as the Italian autostadt. The French system consists of only about 17 kilometers of divided express highway leading from Paris to St. Germaine, although, plans call for extending it up into Normandy and down into Brittany. Other French roads are narrow, winding, and lined on either side by ancient trees. They are pleasant to ride over, but a speed of more than 35 miles an hour is out of the question. Since the roads cannot be widened without sacrificing the trees, and since the French love the trees more than they desire speed, the possibilities of improvements are limited. Nevertheless, the French plan work on about 80,000 kilometers of national roads, mostly the improving of existing roads. The only new highway work in progress was the construction of detours around certain small villages whose narrow, twisty streets had long been traffic bottlenecks on some of the main roads.

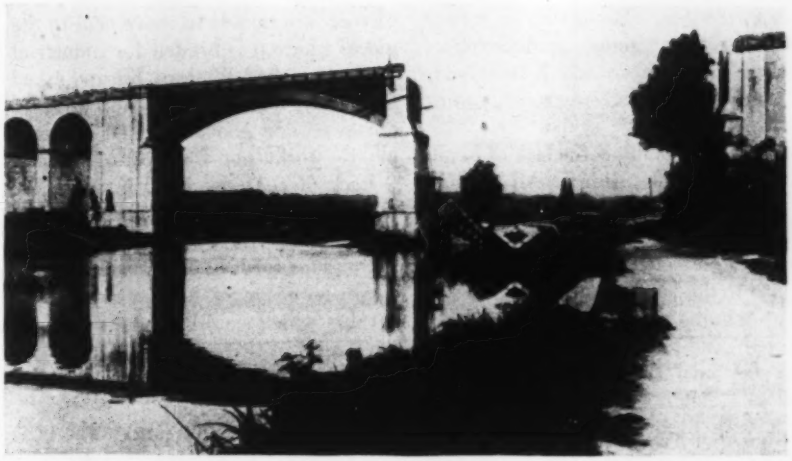


Fig. 4. France is faced with a staggering job of bridge replacement. A typical example is the railroad crossing of the Loing River near its confluence with the Seine southeast of Paris, in which one of the 130-ft. high steel spans was destroyed.

There has been no road maintenance for five years, and during the war some 6,500 highway bridges were demolished. These, of course, have to be rebuilt, and that work is proceeding very slowly for a number of reasons, but principally because of the lack of modern equipment. I stood on the bank of the Seine at Poissy watching a gang of French workmen trying to reconstruct a bridge that had been four times destroyed—once by the Germans in the First World War, once by the Germans in the recent war, once by the French and finally by the British. There had been 15 stone arches, two of which were destroyed by the French in 1940. The Germans who came in to replace them, being a somewhat unimaginative but precise people, assumed that the spans were of the same length.

They built their pier where arithmetic indicated it ought to be. Of course, it was off center and toppled over. After the roadway finally was in place, British Marauders flew over in 1944 at about 3,000 ft. and dropped 150 2,000-ton bombs, destroying all but two spans. The French were now trying to reconstruct the bridge with German prefabricated wooden spans. There was a ½-yard concrete mixer on the site, but no other mechanical equipment of any sort so that the work proceeded by primitive hand methods at so slow a pace as to try the patience of any American engineer.

Coal means everything to Europe

The key to Europe's recovery is fuel And of coal there is a tragic shortage. The predictions of last summer that Europe faced the bitterest winter of its history are now being fulfilled. Without fuel, trains cannot move, factory wheels cannot turn, and the people cannot be employed. Despair had settled over France last summer. The attitude was expressed in the statement, "Without coal we cannot make steel, without coal we cannot make concrete. Why bother to plan anything since we do not have the means to carry out the plans? Give us food, coal and transport and we will prosper; without them we can do nothing."

The key to the coal shortage, in turn, is the low state of production in the Ruhr and the Saar basin—the great coal repositories which normally fueled almost all of western and northern Europe. The Ruhr last summer was producing only 15 to 20 per cent of the pre-war normal and the Saar even less than that. Many miners were killed

in the war. Others are reluctant to return to the pits. Those who do return complain they cannot produce effectively without more and better food, and newly recruited workers are unskilled.

Another difficulty is the lack of barge navigation on the Rhine. All but one of the Rhine bridges were destroyed, and too many of the emergency structures were erected at low level without regard to the needs of navigation. For many months the barges could not get through, and the Rhine, a historic highway for coal transport, was all but useless. After the bridges were rebuilt with higher and wider channel spans barges began to move up and down the river about Nov. 1.

Paradoxically, the railroads, for lack of coal, are unable to move coal to the places where it is needed for industrial purposes. And Western Europe asked coal only for industrial purposes, to create needed goods and put the people to work, not for heating homes.

Lack of coal also contributes to the food shortage, for even where food is available it cannot be moved to starving regions for lack of transport. Denmark, for example, had an actual food surplus which could be exported, yet the harbor of Copenhagen was crowded with idle ships waiting in vain for bunker coal.

To summarize the matter, Russia is going ahead with construction and with ambitious planning, but here the execution of plans is hampered by the shortage of mechanical equipment. Western Europe has an abundance of plans, most of them of limited scope, but it also is largely paralyzed by the shortage of coal needed for transport, to build machine tools and to produce needed materials.

Over all is the sickening wreckage of war which must be cleared away before a new start can be made, and the new start at first must be geared to the modest needs of every day life—food, clothing and shelter—rather than to grandiose or monumental schemes.

The conclusion is inescapable that, even with such assistance as the rest of the world can supply, Europe will be a long time coming back.

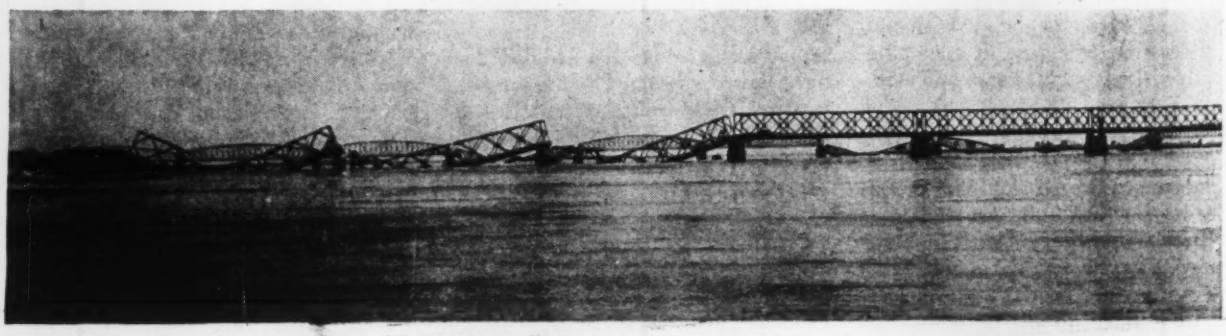
Holland Rebuilding Its Two Longest Bridges

Wrecked by the retreating Germans, the railway and highway bridges across the Hollandsche Diep at Moerdijk, south of Rotterdam, are being rebuilt as fast as conditions and available materials permit, since they form the only link between the large commercial centers of western Holland and Belgium and France. It is estimated that the restoration will require some three years especially as electrification of the railway and other important improvements are to be installed in addition to the repairing of the bridges. In the meantime, however, temporary repairs put the highway bridge back into operation during January, 1946.

When repair work started in July, 1945, six of the fourteen spans of the 4,650-ft. railroad bridge, longest in Europe, were down, while three others were seriously damaged and one pier was destroyed. In the highway bridge, about 650 yd. downstream, four of the ten spans were destroyed, but none of the piers was damaged.

In order to put the highway bridge back into service, two of the intact, curved-top-chord truss spans of the railroad bridge have been temporarily transferred to the highway structure. The length of these railroad spans, about 330 ft., is only slightly greater than the highway spans, so that they are readily adaptable. Each span, weighing 750 tons, was floated off its piers by the use of buoyancy tanks aided by the tide and moved to the highway bridge. The two remaining gaps in the highway bridge were temporarily filled by Callander-Hamilton spans, 165-ft. military trusses used by the British army, temporary intermediate piers being built to support them. As the railroad spans accommodate only a single track, the highway bridge will, for the present, allow only one-way traffic.

The railroad bridge will be shortened from 14 to 10 spans, the four wrecked spans being replaced by an earth dike 1,500 ft. long. Two damaged spans will be repaired by members taken from the destroyed spans. Later, as soon as new permanent spans have been fabricated for the highway bridge, the railroad spans there will be returned so that a single track rail line can be put into operation by the middle of 1946. Meanwhile, the piers of the railroad bridge will be widened to render them suitable for a double track structure. Simultaneously, the bridge is to be raised 6.5 ft., and later an entirely new double-track railroad bridge will be constructed.



Two of the longest bridges in Holland as they were left by the retreating Germans. The four wrecked spans of the highway bridge in the foreground have been replaced temporarily by two of the good spans from the railroad bridge in the background and by shorter military truss spans. Permanent reconstruction of both of the bridges is being carried on in the meantime.

Latin America Pushes Construction Jobs

***Contents in Brief**—Virtually every country south of the border is initiating development programs that call for a wide variety of construction activity. American dollar balances held by these countries, coupled with the probability that loans also will be made available, indicate that there will be many opportunities for participation by U. S. engineering firms, contractors and equipment manufacturers. Specific project listings and an appraisal of the plans in some of those countries reveal the nature of the improvement programs that are being fostered for the years ahead.*

U. S. ENGINEERING FIRMS, contractors and equipment manufacturers can visualize a big market for their services and products in Latin America, if existing plans, aspirations, and dollar balances totaling four billion are used as the yardstick.

Although the four billion American dollar balance that accumulated during the war years is not earmarked for construction alone, a substantial part of it will be devoted to improvement enterprises scheduled by almost every one of the countries south of the border. And to help matters along, the U. S. Export-Import Bank (Eximbank) continues to take an active part in the financing of projects that are related to the economic welfare of these countries.

Whatever yardstick is used to measure opportunities, however, needs to be carefully calibrated. For example: The demand for construction equipment and materials is real, but there is little evidence that it is being or can be satisfied. Higher prices and delays in deliveries laid to strikes and other causes in this country are the basis of mounting irritation that may result in cancellations later when things can be obtained from Europe. And not to be overlooked is the growing use of import-permit systems in Latin America designed to protect national products from foreign competition.

Finally, the political instability of some governments is a factor that always must be taken in account by firms who undertake foreign contracts. The overthrow of the government in Venezuela last year, for example, caused some sleepless nights for several North American contractors and engineers operating in that country.

The following survey, compiled with the aid of *Engineering News-Record's* foreign correspondents, furnishes a quick appraisal of conditions. It reveals the demands that could be made for U. S. "know how" and construction equipment, and points up the types of work claiming attention. Roadbuilding, hydro power facilities and railroad construction occupy primary importance, with port improvements, airfields and sanitation programs closely following.

BRAZIL NEEDS CONSTRUCTION EQUIPMENT

The industrial policy of the former Vargas government, which aimed at the creation of basic industries, has been responsible for the large volume of major construction operations now under way in Brazil. Chief project is the Volta Redonda steel plant, which is to start operating this year. An Eximbank loan of $40,000,000 for the purchase in the USA of material and equipment was a decisive factor enabling Volta Redonda to be put into execution. Total capital outlay, including loan, is $95,000,000, mostly subscribed by government and semi-official organizations.

Besides erection of blast furnaces and rolling mills, the project includes installation of a washing plant for national coal to be used in the furnaces (plant supplied by McNally Pittsburgh Corp.). With present iron and steel output exceeding 500,000 tons yearly, Volta Redonda's eventual capacity (1,000,000 tons) will make Brazil almost independent of imports of iron and steel raw and semi-manufactured products. The U.S. firm of Arthur G. McKee & Co. of Cleveland supervised execution of the project.

Next important operation is the Rio Doce mining project (*ENR* Dec. 30, 1943, vol. p. 954) also financed by an Eximbank loan of $19,000,000. Capital outlay with loan is $49,000,000, mostly government-subscribed. The project includes development and operation of the world's richest iron deposit, reconditioning the Victoria-Minas Railway, and building docks and ore-loading and storing facilities at the port of Victoria. Target aimed at is annual export of about 1,500,000 tons of iron ore, mainly to the United States and Great Britain.

Partial execution of the project has already brought a big increase in the population of the valley and attracted $12,000,000 of private capital to the setting up of local steel and other industries. U.S. engineering firm, Parsons, Brinckerhoff, Hogan and Macdonald, New York, carried out engineering for the railway project; construction contracts are held jointly by the Morrison-Knudsen Co., of Boise, Idaho and The Raymond Concrete Pile Co. of New York.

Third important operation, financed by Eximbank loan of $2,000,000, with U. S. technical assistance, is the National Motor Factory for the manufacture of Wright Whirlwind aircraft motors, transport and training planes, tanks and tractor engines. Capital outlay is $6,000,000.

Important railroad operations

Lack of railway transport in Brazil makes railway construction of vital importance. Among the chief works now in hand are the transcontinental railway to Bolivia (estimated cost $18,000,000) for bringing Bolivian oil to Brazil; a new line linking Sao Paulo with the nearby port of Santos and doubling existing rail transport capacity (cost $6,000,000); completion of

Roadbuilding equipment such as this on a Brazilian highway project near Caratigna ranks first in the needs of Latin American countries for construction machinery. Despite low wage rates, hand labor methods cannot compete with the quality, speed and economy of mechanized construction techniques developed in the United States.

the North-South (Bahia-Minas) line; and re-equipment and improvements to the Mogyana line (in Sao Paulo) $15,000,000.

Only two percent of Brazil's 22,000 miles of railway is electrified, and important work now in hand include electrification of 187 miles of the Sorocabana Railway ($11,000,000); further electrification of the Central Railway suburban lines at Rio (U.S. Electric-Export Corp. is supplying material costing $6,000,000), also electrification of this concern's suburban lines—50 miles—at Sao Paulo ($5,000,000); further electrification—40 miles—of the Paulista Railway. Similar projects under study are electrification of British-owned Sao Paulo and Leopoldina railways, the latter from Rio to Petropolis.

Transportation needs large

Bound up with current Brazilian transport problems is re-equipment of the ports. Santos, the chief port, has a program of re-equipment in hand ($10,000,000), Rio port authorities are studying a similar project, and many other large ports (Maceió, Bahia, Ilhéos, Ceará, Laguna) badly need re-equipping; for this purpose a new federal tax on cargo was instituted recently. Dredges particularly are needed to clear port entrances.

Brazil has also big road construction projects in hand—of existing road extension totalling 168,000 miles only 25,000 miles are in good condition—and federal and state expenditure on roads runs to about $20,000,000 yearly. Road construction has been greatly delayed by lack of bulldozers during the war.

Brazil's extensive hydro-electric resources and lack of fuel has made her turn to hydro-electric developments for power. Projects now going into execution include the Sao Francisco River plan (Brazil's TVA—initial capacity 110,000 kw. to be raised later to 440,000 kw. (see *ENR* May 3, 1945, vol. p. 626); an increase of 50,000 kw. in the output of the Cubatao station (in Sao Paulo) which has 300,000 hp. installed and a total capacity of 1,000,000 hp; enlargement of the Ribeirao Lages Station (Rio State) from 95,000 to 135,000 hp; construction of a new plant on the Macabu River (Rio State) at a cost of $5,000,000. In the state of Rio Grande do Sul a big hydro-electric plan will be executed, which involves installation of plants on five rivers.

Besides Volta Redonda, the government is interested in pushing other basic industry projects including installation of large-scale plants producing caustic soda, light metals, chemicals, machinery, woodpulp and paper, and for refining oil. Shortage of rolling stock has led Brazilian railways to set up a concern for manufacturing railway material, which is installing a foundry costing $5,000,000 designed by American Steel Foundries and made at Detroit.

Opportunities look good

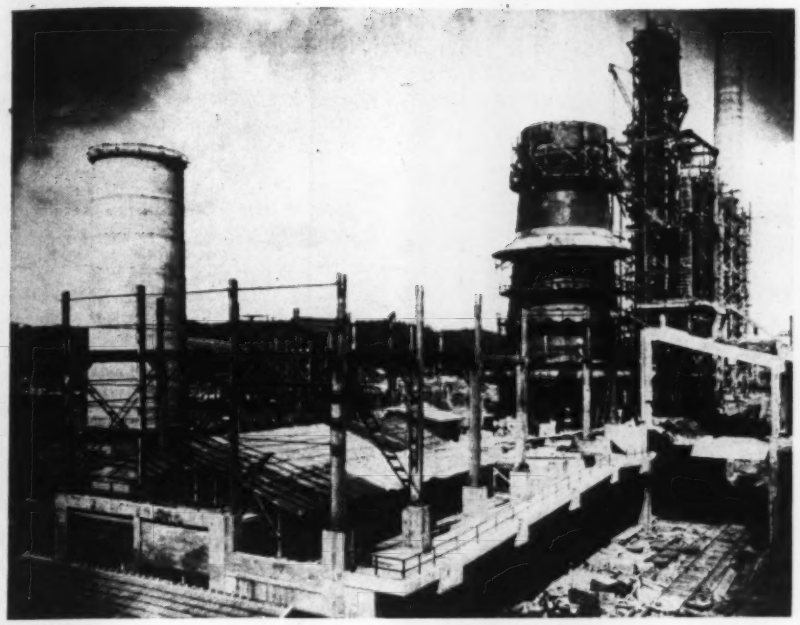
Opportunities for the employment in Brazil of U.S. engineering firms and construction companies should be good, since competition from other foreign constructors is at a minimum. The Danish concern, Christiani and Nielsen, is practically the only foreign construction firm now undertaking large works in a general way. U.S. engineering firms may find it desirable to seek contracts on railway, port and airport construction. Much larger airports will be required for intensified postwar air traffic especially if U.S. loans are used to buy the material required.

Industrial construction is likely to be greatly intensified when new basic industries stimulate the creation of subsidiary industries (steel tubes, tools, chemical by-products, electric motors, aircraft, dehydrated food). Typifying this trend is the award of an $18,000,000 contract to Oscar Kohorn, Ltd., New York, for the design, construction and equipment of a viscose rayon plus foodstuffs where they are pro-

Increased urban construction (hotels for increased tourist traffic, blocks of offices, apartment houses, amplification of gas, water, light and telephone services, installation of freezing chambers for storing meat, fruit, fish, vegetables) required by Brazil's rapidly expanding urban population may provide some opportunities for U.S. construction firms. Many more warehouses are needed for storing surplus foodstuffs where produced.

Construction supplies needed

Construction equipment and material needed from the U.S.A. include specialized equipment required for the projects mentioned above, besides which Brazil is experiencing an acute short supply of ordinary construction material (including that of domestic production—cement, iron and steel, timber, electrical fittings). The chief difficulties expected in obtaining construction material from the U.S.A. are delays in delivery due to strikes, intensified competitive demand from Europe, to lack of credit facilities. U.S. exporters are demanding cash against



Blast furnace at the Volta Redonda steel plant, a $95,000,000 Brazilian project, which is partly financed by a U. S. loan. Design and construction operations are being supervised by engineers and technicians from the United States.

goods or the opening of a letter of credit, whereas prewar European suppliers gave Brazilian importers credit for 6 months or more.

Brazil's import permit system is another obstacle, as in some cases (electric motors of under 75 hp.) it is designed to protect the national product by keeping out the foreign. Restrictions are also placed on the import of used machinery, which is greatly in demand due to the difficulty of getting new machinery, and reconditioned machinery can only be imported by the user after it has been inspected by experts in the U.S.A.

CHILE ACCELERATES HYDRO PROJECTS

Partly as a result of President Juan Antonio Rios' recent visit to the United States, but chiefly the culmination of several years of planning by Chilean government departments working under the coordination of the *Corporacion de Fomento* (Chilean Development Corporation), an energetic plan for widespread roadbuilding, development of hydro-electric resources, airport building, and construction of canals, drydocks and sawmills, is now taking shape.

Despite wartime limitations, Chile has been extremely active throughout the war on the beginnings of its hydro-electric plants. When all are completed they will hasten the industrialization of this mountainous country. More than $20,000,000, borrowed from the U.S. Export-Import Bank through the *Fomento* are being invested in these plants, all of them located in the southern areas of Chile.

One of the most important of these is the Sauzel plant on the Cachapoal River for which approximately $10,000,000 has been earmarked. Of this, some $3,000,000 is being used for the purchase of machinery and supplies in the United States. Most of the equipment for the project has already been contracted with Westinghouse International; hydro-electric equipment through I. P. Morris Co. (subsidiary of Baldwin Locomotive) and with penstock and piping ordered from Bethlehem Steel.

The Sauzal project was started late in 1942, and although a number of difficulties were climaxed by a fire in October, 1945, it is expected that the plant will be in operation within a few months. Output will be 75,000 kw. from three generating units of 25,000 kw. each operating at a head of 385 ft. and a discharge of 900 cfs. Sauzal, which will be the major project, will supply metropolitan Santiago with power.

Other important hydro projects sponsored by *Fomento* include Abanico, on the Laja River, which will be in operation by mid-1946. It is a six million dollar project with approximately half devoted to the purchase of machinery and equipment in the United States. Capacity will be 40,000 kw. with two units, with later expansion provided to 80,000 kw. in 1947-8. Major equipment already ordered from International General Electric, hydraulic equipment from S. Morgan Smith & Co., penstock and piping from the Bethlehem Steel Co.

Still in the planning stage, and with little of the major units ordered, are three other power plants totaling over $6,000,000 in appropriations. All details of orders or supplies for *Fomento* projects in Chile are handled by its New York office, Chilean Development Corp., Room 2623, 120 Broadway, New York.

Roadbuilding is planned

Supported by a new tax of 60 centavos per liter on gasoline, which will be used exclusively for roadbuilding, the Chilean Ministry of Public Works is completing its plans for large-scale postwar roadbuilding. During the war all roadbuilding in Chile was inactive both for lack of funds, and lack of gasoline with which to make the roads useful.

Major project in the new list of roads to be built is a five-lane highway of several hundred miles connecting the northern agricultural center of La Serena with Santiago. Some $13,000,000 will be expended in the project, completion of which is expected to take four years. When finished the road will form a link in the projected Pan-American Highway.

Contracts for these and other major roadbuilding projects are being given out locally by the Ministry of Public Works. Four Santiago firms will build the Serena highway with contracts amounting to about $10,000,000. Other roads of smaller magnitude are planned in the southern regions where there are few paved roads. Southern Chile is the most productive agricultural region, and it is expected that the long range road program will open up this region to the major population centers.

The Public Works Ministry is also contemplating development of several coastal cities, such as Concepcion, as major seaports, and is now asking for necessary funds. Together with the Ministry of Defense, the public works ministry is embarking on an airport development program, starting with the enlargement of Los Cerillos, the national airport outside of Santiago. Major Chilean cities will have modern airports to be used by military and commercial planes.

An impressive program

Foregoing is only a sample of Chile's ambitious development plans. Other projects now progressing rapidly include a large canal in southern Chile to open up forest resources; a United States wood mission, now on location, is advising on the development of sawmills, etc. Also planned is a large steel mill at San Vicente, near Concepcion. For this a loan of $28,000,000 has already been obtained from the Eximbank. The latter has also granted a loan of $5,000,000, part of which is to be used to acquire additional equipment for the El Abanico power plant, which will serve the steel mill. The steel works is expected to have an annual production of 180,000 tons.

While in the United States President Rios negotiated a loan of $6,000,000 from U.S. investors for the construction of a huge drydock in Valparaiso, chief port on the west coast of South America. The project, which will take three years to complete, will employ 1,500 laborers. No details regarding the "U.S. investors" are available as yet in Santiago.

Government officials, as well as the average Chilean citizen, are impressed with the magnitude of engineering and construction plans for the years ahead.

PERU AIMS FOR INDUSTRIALIZATION

A variety and volume of construction, aimed toward increasing industrial as well as agricultural opportunities, characterize postwar development in Peru. It is estimated that contracts being let at the present time alone represent an investment of some $50,000,000. How much more and how fast investment opportunities will be advanced depends in large measure on the manner in which Peru will be able to straighten out foreign loan difficulties. The latter extend back for some years and involve repayment of about $99,000,000 on principal and some $83,000,000 on interest charges.

Centered in the Chimbote Bay region is a vast industrialization program being carried out by the Corporacion Peruana del Santa and calling for the overall expenditure of $30,000,000. The program includes the completion of port works, housing and sanitation facilities at Chimbote, rehabilitation of a railroad, the development of coal mining and the construction of a 125,000 kw. hydro plant as well as the extension of nearby irrigation works. (*ENR*, Sept. 21, 1944, vol. p. 360).

Port works in Chimbote have been virtually completed by the Frederick Snare Corp. of New York, and construction of the Canon Del Pato hydroelectric project has been moving forward since 1942; Barton M. Jones, formerly chief design engineer of the Tennessee Valley Authority, is engineer-director in charge of the project. (*ENR*, Sept. 21, 1944, vol. p. 366). Excavation for the dam and 1.5 miles of tunnel are completed. Two generating units, including water-wheel and transformer equipment, having a capacity of 50,000 kw., are on order from the Westinghouse Co., with delivery expected in about 18 months. Thus far the project has been financed with Peruvian government funds coupled with a small Eximbank loan for purchase of U. S. equipment.

Road program under way

Peru has embarked on a five-year highway construction program expected to cost over $50,000,000; of this amount at least $10,000,000 will be required for equipment needs. Peru now has nearly 20,000 miles of highway and completion of the program will provide 3,000 additional miles.

Encouraging progress has been made in linking coastal areas with interior river routes by means of "penetration highways." More than 750 miles of such highways have been graded, 120 miles widened and improved, 450 miles prepared for surfacing, and 31 miles paved with asphalt.

Now nearing completion is the longest highway bridge in the Amazon River basin. The structure, spanning the Aguaytia River, is 2,300 ft. long and consists of a suspension span of 560 ft., two steel truss spans of 108 ft. each, and 33 steel I-beam spans each 46 ft. in length. It provides for two lanes of traffic and forms part of the highway system connecting Lima with Ucayali, an important tributary of the Amazon.

Among the larger government irrigation projects underway are: (1) the Mantaro left bank project, which will provide irrigation for about 29,-

Sanitation work, typified here by the construction of a malaria-mosquito drainage project at Chimbote, Peru, is a necessary first step in the industrialization programs that are being initiated in most of the South American countries.

000 acres when completed in 1947; (2) dams and diversion works to tap Lake Choclococha, Lake Orccocha and Lake Caracocha, and which will bring to the Atlantic watershed water for the improvement of irrigation facilities for 60,000 acres in the Ica Valley on the Pacific side of the Andes; it is expected that construction bids will be called at an early date; (3) also slated for early execution is an irrigation project for the Tacna valley.

Housing and town planning

A national housing program, initiated by the Peruvian government in September, 1945, includes seven neighborhood unit projects for the Lima-Callao area. Each project provides for a self-contained community of 5,000 people. The 1,000 residential apartments will be surrounded by park areas and facilities are to include library, church, theatre, market and commercial centers, civic buildings, restaurant, schools, first aid and police station, swimming pool, football field and other recreational facilities. In December 1945 six Peruvian constructors were awarded contracts for building the first unit.

Rebuilding of the oil towns of Talara and Negritos is planned by the International Petroleum Co. at a cost of $15,000,000. Work on this project may be undertaken in about six months and plans for a garden-city project making the two towns into one have been drawn up by a group of Peruvian engineers headed by Alfredo Dammert.

Food processing plants

The ocean-fishing industry is evolving into one of the most promising undeveloped industries in Peru. Several companies have plans involving the construction of canneries, fish meal plants, cold storage and freezing units. The first of these projects, a $1,000,000 plant at Chancay, near Lima, will be built by the Frederick Snare Corp. of New York.

Work has been started by the Ministry of Public Works on the construction of 32 miles of railway designed to link the new and modern port of Natarani north of Mollendo, with La Joya station on the Southern Railway of Peru.

The Cerro de Pasco Copper Corporation is building a 50-mi. standard gage line to run from the main line of the Central Railway of Peru to Chalcha; this will cross the Continental Divide at two different places. Forming part of this project is an aerial tramway that will transport ore from Yauricocha over a length of 9 miles and across the divide at an altitude of 15,490 ft. to the railway.

The Peruvian Airport & Commercial Aviation Corp. reports that major improvements at the Limatambo airfield (serving international traffic at Lima) will be completed by July 1946. This corporation is reported to have made the first detailed study of all Peruvian airports as the basis for a vast improvement and construction program.

Most all types of construction equipment are needed as a result of constant service during the war years and few replacements. Difficulties foreseen in regard to importing equipment from the U.S., as noted previously, might be higher prices and delayed deliveries due to strikes. Presumably the big headache the importers in Peru had getting exchange under the import-permit system is avoidable as machinery and equipment are the only things for which exchange may be bought easily.

COLOMBIA WANTS HIGHWAYS AND RAILWAYS

A great highway and railway construction program—calling for the building of 2,500 miles of roadway and the laying of over 1,000 miles of new track—is being launched in Colombia.

Key project, still in the planning stage, calls for an international railroad to link the capital, Bogota, with the Venezuelan port of Concha on the Caribbean.

Bogota, although a city of 400,000, has no direct rail contact with the outside world. Busses and trucks, working on a shuttle system in the high mountain passes of the Andes, link the railroad lines. Although Buenaventura, the nearest port on the Pacific, is only 450 miles from Bogota, it takes longer to ship a ton of freight over this rail-truck-rail line than it does from New York to San Francisco.

In addition to the program designed to ease the country's acute transportation problem, plans have been drawn up for the construction of a hydroelectric project, irrigation works, extensive navigation improvements, and considerable industrial facilities.

Equipment purchases planned

According to Albert Arango and Gregoria Mejia, two Colombia contractors now in this country under auspices of the Office of Inter-American Affairs, it is planned to spend $6,000,000 yearly for the next five years on new highway construction. Some 30 percent of this amount will be used for equipment purchases.

Colombia started a large highway program in 1932. Since that year an average of $5,000,000 annually has been earmarked for new construction and improvements, and in 1944, an additional $6,000,000, secured on a loan from the Export-Import Bank, was used for highways. In 1945 over $10,000,000 was made available for highways, consisting of $6,000,000 from a direct national budget appropriation and $4,000,000 from gas and oil taxes.

A 125-mile section of the Pan-American Highway remains to be built in Colombia. This section, on which work has been started, is near the Panama border. In the Department of Bolivar work has just been started on a 62-mile road job, the contract being held jointly by the Raymond Concrete Pile Co., New York and Winston Brothers, Minneapolis, Minn.

Plans are currently being discussed in Bogota for a 525-mile railroad to connect the capital with Concha on the southern end of Lake Maracaibo. The lake is connected by an open channel with the Caribbean and is accessible to ocean-going ships.

The proposed route, starting at Bogota, will make use of the existing 135-mile Northern Railroad of Colombia which runs to Barbosa. Some 143 miles of new construction will be required between Barbosa and Bucaramanga, capital of Santander. Surveying on this section already has been completed.

From Bucaramanga, the proposed line would run via Pampalona, El Diamente, Cucuta, El Guayabo, to Concha. The entire line would be 525 miles long, of which 451 would be in Colombia, 72 in Venezuela. At no point would the grade exceed three per cent.

A $15,000,000 railroad construction job to connect the Pacific port of

Cartagena with the town of Bolombolo in the state of Antioquia, near the city of Medellin and on the Cauca River, will soon be started. The work is expected to take 10 years and totals 380 miles.

Another proposal calls for the completing of rail connections between Bogota and Buenaventura on the Pacific. At present time this railroad has a 95-mile gap in the middle where passengers and freight must be transported by busses and trucks over 11,000-ft. Quindo Pass. This project, which will connect the towns of Armenia and Ibague in the state of Tolima, will cost approximately $10,000,000.

Navigation program announced

Because water transportation on the Magdalena is so important, navigation improvements, costing $500,000 a year for the next three years, have been programmed. Work also is to start soon on a 75-mi. navigation canal to connect the city of Cartagena with the Magdalena River.

It is also announced that a $10,000,000 loan from the Eximbank for irrigation construction in Colombia has been approved. Survey and plans are now being carried out.

Big steel mill at Boyaca

Other work now starting in Colombia includes construction of a $10,000,000 steel mill at Boyaca. The city of Medellin, which is one of the largest inland towns of Colombia, has started construction of a 100,000-kw. hydro electric plant in the mountainous Rio Grande area. At Cartagena, the Frederick Snare Corp. of New York is building two warehouses, thus adding facilities to the port works finished by that firm a few years ago.

Parsons, Brinckerhoff, Hogan and Macdonald, New York consultants, are now designing the 13,000-kw. Caldas hydro project, costing about $3,000,000, which will serve Manziales and adjoining towns. The firm also has started work on the Sisga dam, a $1,000,000 irrigation facility located in the Bogota valley region.

MEXICO PLANS MUCH FEDERAL WORK

Highways, irrigation works, port facilities and other public projects to cost more than $46,000,000, are planned by the Mexican federal government for 1946.

Major item in the program announced by President Manuel Avila Camacho is a $19,000,000 irrigation project serving 15 states of that country. The bulk of the money is to be spent for the completion of systems now under construction, and for proposed work along the Colorado and Lower Rio Grande rivers.

In Mexico City, D. F., and its suburbs, the federal government expects to earmark $10,000,000 for roads, bridges, improvements to the water system, parks, sewage disposal facilities and schools. Additionally, the government will spend $5,000,000 on construction of a "university city" within the capital, to house the 14 schools of the national university now scattered throughout the city.

Another $2,000,000 will be spent on federal highways in Mexico, Queretaro, San Luis Potosi and Coahuila State.

Lerma water project

A serious water shortage in Mexico City has lent impetus to the development of a new source of supply at Lake Lerma in the vicinity of Toluca. Water from the lake and adjacent springs will be brought to Mexico City by a 32-mile long aqueduct, 10 miles of which is in rock tunnel through the mountains. Several sections of the aqueduct already have been completed, and rapid progress is reported on the tunnel from headings at four shafts. About 4,000 men are employed on the project.

The present city population is about 2,000,000, but the new system is designed to serve more than 3,000,000 people, the assumed consumption demand being set at 220 mgd.

Total cost of the project, expected to be completed in 1947, is estimated at $8,660,000. This figure includes cost of regulatory dams and other appurtenant structures on the conduit.

Expansion of power facilities

A program calling for a 45 percent expansion of electric power output, (for which an Eximbank loan of $20,000,000 would cover purchases in the U. S.), is under study because of the increase in Mexican industrial facilities.

A second unit of the hydro-electric project of Ixtapantongo, involving an additional 40,000 hp., is expected to be sufficient for the electric energy needs of the federal district as well as those of adjacent areas. Completion of the program will provide better service to approximately 20 important cities and will give service to some 70 towns that at present have insufficient or no service.

The government also has announced that all but 189 miles of Mexico's 1,422-mile section of the Inter-American highway will be completed before the end of 1946. The second

To relieve a serious water shortage in Mexico City the federal government is developing a 220-mgd. lake supply. Above is shown a section of the 32-mile aqueduct now under construction; a 10-mi. section is in rock tunnel.

section of the road, between the capital and Suchiate, on the Guatemalan border, is now under construction, and will be four-fifths completed by the end of the year. First section, a 741-mi. stretch from Laredo, Texas, to Mexico City, was completed in 1936.

Among the major construction projects for Mexico are: a $14,000,000 railroad for the states of Chihuahua and Sonora to be constructed under force account by the Kansas City, Mexico and Orient Railroad; a $1,000,000 rayon manufacturing plant at Guadalajara, Mexico, to be constructed and operated by the Viscosa Mexicana (Celanese Corporation of America); port works at Mazatlan to be constructed by the Secretary of Navy, Mexico City, at a cost of about $3,000,000, the work to be done by shipyard workers; and a sports arena in Mexico City to cost about $8,000,000. (*ENR* Nov. 8, 1945, vol. p. 632).

ECUADOR NEEDS WATER WORKS AND BRIDGES

Guayquil, the major air and seaport of Ecuador, hopes that something can be done this year in building a new water supply. Both the supply and distribution facilities have been in very poor condition for years; leakage alone is so bad that for several hours each day the supply must be shut off.

An Eximbank loan of some $8,000,000 now appears possible for water supplies at both Guayaquil and Quito. Proposals for the Guayaquil work were taken recently and informed quarters indicate that the contract may go to a combination of New York firms, which includes: The Frederick Snare Corp., contractors; Buck, Seifert and Jost, design engineers; and The Pitometer Co., consultants.

The city also expects improved railroad service from the construction of a bridge for the Southern National Railway across the waterway separating the city from the mainland. A report on this project, whose cost may reach $3,000,000, is being prepared by Parsons, Brinckerhoff, Hogan & Macdonald, New York consultants.

Another project on which U. S. engineers and contractors have been queried is the $4,350,000 dredging project on the Babahoyo River. It is proposed to dredge the Babahoyo River to the mouth of the Yaguachi, to dredge the Daule River above the city of Daule and to build a canal from the Yaguachi to the Babahoyo.

Already under way is the construction of a 100-mile double lane macadam road, part of the Ecuadorean section of the Pan-American Highway, which will extend from Quito, the capital city, to the border of Peru. A lump sum contract totaling more than $2,000,000, is held by the J. A. Jones Construction Co. of Charlotte, N. C.

An unfortunate experience on a road contract was that of the Ambursen Engineering Corp. of New York, whose expulsion from Ecuador was ordered by government officials on December 11. The government alleged that Spencer W. Stewart, manager of the company, was implicated in a plot to foment a revolution.

The Ambursen firm was engaged in supervising the construction of a highway for the Ecuadorean Development Corporation, an agency sponsored by the Eximbank, which is financing the work. Following publication of the expulsion charges, the U. S. Department of State said that it would not intervene in behalf of the Ambursen Corporation. In a statement to *Engineering News-Record*, Mr. Stewart denied that he or his firm were involved in any plot and that the difficulties arose from an internal government situation in Ecuador.

BOLIVIA BUILDING IRRIGATION WORKS

Exceedingly rich in minerals, but woefully deficient in agricultural resources as evidenced by a recent survey showing that only one-fifth of one percent of the total area of the nation is under cultivation, Bolivia has sought to remedy the situation by means of an irrigation program.

The entire program is as follows: Angostura dam in the department of Cochabamba, to irrigate 22,000 acres; Rio Viscachani dam in the department of La Paz, to irrigate 6,200 acres; Rio Tacaqua dam in the department of Oruro, to irrigate 12,000 acres; Rio Desaguadero dam, also in Oruro, to irrigate 15,000 acres, and Rio Pilcomayo dam in the department of Tarija, to irrigate an area of 100,000 acres.

First of the projects to be undertaken by the Bolivian Department of Irrigation and far advanced in construction, Angostura dam will have a capacity of 80,000 acre-ft. It is located about 12½ miles from the city of Cochabamba. The structure will be 460 ft. long and 20 ft. wide at the crest, with a height above the original river bed of about 72 ft. Total cost of the project, including dam, spillways and irrigation channels, will be about $1,260,000.

Part of the Angostura project is the auxiliary dike of Santa Cruz from which starts the canal for the irrigation of the valley of Cochabamba. Two hydro-electric plants are to be built, one above the auxiliary dike and the other in Alalay. The Santa Cruz plant will develop 2,200 kw. and the other, 450 kw.

At a point more than 13,000 ft. above sea level Rio Viscachani dam will be constructed at the southern part of La Paz. Rio Tacaqua dam, southeast of Oruro, one of the big tin centers in Bolivia, will be built at an altitude of 14,000 ft.; it will be 86 ft. high and will have a capacity of 35,000 acre-ft.

Desaguadero dam will fulfill two functions: irrigation near the city of Oruro and improvement of navigation on the Desaguadero River, which flows from Lake Titicaca to Lake Poope. The navigation improvement is expected to facilitate transportation of mineral ores from this area, one of the biggest tin-producing centers of the world.

Rio Pilcomayo dam will be constructed near Villa Montes on the Argentine frontier.

Road builders at work

One of the biggest projects in Bolivia on which a U. S. firm is engaged is the 250-mile highway to connect the towns of Cochabamba and Santa Cruz. The $9,500,000 contract is held jointly by a combination of the Warren Bros. Co. of Cambridge, Mass. and the F. H. McGraw Co. of Hartford.

The road will serve as a connecting link for a railroad that is being built eastward from Santa Cruz to Corumba, a Brazilian town near the border of Bolivia. Brazil is building this railroad in exchange for land gained some years ago, and it is expected to cost $18,000,000. The highway starts at an elevation of about

1,200 ft. at Santa Cruz, passes westward over a 10,000 ft. range and ends at Cochabamba, which has an elevation of 8,500 ft.

Bolivia intends eventually to lay a $35,000,000 rail line between these points but will first construct the road, which is not only cheaper in first cost but can take a permissibly shorter and steeper route. At present the dry season road across this span is so bad that the truck rate for goods is 30 cents a ton mile.

The road is being built under the direction of the Bolivian Development Corp., which has a working capital of about $25,000,000, and is financed jointly by the Bolivian government and the Eximbank. Surveys for the road were made several years ago with the aid of engineers loaned from the U. S. Public Roads Administration (*ENR*, April 18, 1943 vol. p. 482).

A recent $5,500,000 loan from the Eximbank will provide for the development of a petroleum program. Of this amount $1,000,000 is being spent for drilling operations in the Santa Cruz area. If this proves encouraging, work will go ahead on construction of a pipeline from the oil fields to Santa Cruz, where a refinery will be erected. The two latter projects will entail a loan of $4,500,000.

VENEZUELA KEEPS CONTRACTORS BUSY

Probably none of the South American countries has sounder financial resources for public works and more U. S. engineering and construction talent at work than Venezuela. Income from oil royalties is the major source for federal appropriations, although it should be noted that the $10,000,000 water supply for Caracas is bond financed.

In spite of a revolution last year, the government has not changed its plans or tempo in the prosecution of a vast public works improvement program. The program emphasizes water supply and sanitation improvements, which are being vigorously pushed by a new federal agency known as the National Institute of Sanitary Works. Port works, public buildings and road construction are also being undertaken.

The Caracas project, biggest water supply job in South America today, involves the construction of storage and diversion structures, major replacement and extension of virtually the entire distribution facilities, and the installation of at least two treatment plants. Present construction, however, is confined to the storage and diversion facilities along with the development of some hydro power. Contracts for immediate execution call for some $10,000,000 of work, and it is anticipated that the balance of the program will cost an additional $9,500,000.

Design of both the supply and distribution systems is being handled by Parsons, Brinckerhoff, Hogan & Macdonald, New York consultants. Construction operations started about a year ago by the firm of S. J. Groves & Sons Co. and Johnson, Drake & Piper, Inc., are expected to be finished in 1947. A subcontract for the manufacture of some 21 miles of reinforced concrete pressure pipe is held by the Lock Joint Pipe Company of Ampere, N. J.

Gerald McCarthy, South American manager of the Parsons, Brinckerhoff, Hogan & Macdonald firm, reports his company also is completing designs for the sewer system of Caracas, including the paving of the Rio Guaira, the estimated cost of which will be $8,100,000. This firm also has contracts for the construction of four small water supply dams on the Isla Margarita just off the coast of Venezuela, and has two hospitals under design in Caracas. In addition, the firm has just begun supervision of oil camp expansion programs for the Gulf and the Standard oil companies, each contract of which calls far an expenditure of over a million dollars. Finally, Mr. McCarthy reports that his firm is supervising construction of the Puerto Caballo sewers and pumping station, contracts for which call for an estimated $1,500,000.

Concrete block, easily made from local materials, is widely used for building.

The Raymond Concrete Pile Co. is completing a $3,000,000 pier and warehouse contract at La Guaira, and has just completed the installation of a sanitary sewer system costing $2,000,000 at Maracaibo. At Cumana, in the eastern part of Venezuela, this firm is engaged on a $1,000,000 pier and warehouse job.

A pier, breakwater and warehouse at Carupano, the total contract for which is about $1,250,000, is being built by the Frederick Snare Corp. of New York.

Perhaps the biggest public buildings job in Venezuela is held by the Merritt, Chapman & Scott Corp. of New York, which is building a medical school group consisting of a hospital and six buildings, the total cost of which will be about $10,000,000. Work was started about eight months ago.

One of the most recent jobs to get under way is a $1,000,000 office building in Caracas, the contractor for which is Caldwell & Scott, Inc. of New York.

Road for oil companies

No estimates are available on the amount of work, either construction or development, to be undertaken by the oil companies that operate in Venezuela. It is reported, however, that Williams Bros. Corp. of Tulsa, Okla., holds a contract for a 155-mile section of roadway in the Puerta de la Cruz area, estimated cost of which is $1,200,000.

Plans are being completed for a new airport at Caracas. It is estimated that this project will be constructed within two years and may cost about $2,500,000. The principal runway will be 5,900 ft. long.

Bombed Bristol Plans a Brighter Future

By H. M. Webb
City Engineer, Bristol, England
As told to
McGraw-Hill World News
London Bureau

MANY A CITY ENGINEER, grappling with the problems of revamping his antiquated town to fit changing modern conditions, has been impressed with the possibilities of blowing up the entire metropolis and starting over with a clean slate. But like the beggar who can't ride because wishes simply are not horses, the city-planner has to keep plugging along with improvisations, never getting a chance to rebuild his town from scratch.

Exception to the rule—tragically enough—is bomb-blasted Bristol. A favorite target for Goering's Luftwaffe, because of its important role as a port, this old and famous British city was so badly battered that complete replanning is now possible. A city-planning headache before the blitz—because of irregular, narrow streets, ancient buildings, and 1,000-year-old layout—Bristol today offers reconstruction opportunities far beyond any engineer's wildest prewar dream.

Bombs wiped out approximately 300 acres of the city's central and dockside area, and damage was reported to 76,000 of the city's 100,000 homes. The fact that over 2,500,000 tons of rubble already has been removed from the city gives a vivid idea of the extent of damage.

Because of the magnitude of the project, shortage of materials, and the problems attendant to reconversion, Bristol's planning is still undergoing changes and refinements. The city council, however, has approved proposals for the complete rebuilding of the central area of the town, and for the acquisition of suburban land for accommodating industrial sites and developing new self-contained residential areas. Whatever temporary, emergency construction is required will adhere to this long-term plan.

As a study of the bomb-damage map on the next page will show, the Nazis did a thorough job in reducing the center of the city—which straddles the River Avon and a special "floating harbor" of gated wet basins—to rubble. Heaviest damage was done during the famous blitz months in the Fall of 1940.

Just how city-planning has been applied to the bombed-out area in order to widen the main streets, relocate industry and business houses, and rezone the center of the city, can be seen by a contrasting study with the larger map showing the planning and reconstruction scheme. But despite the fact that the entire center of the town has been wiped out, replanning still presents some knotty problems since everything has to be made to conform to existing transportation and dockage.

As a port city, Bristol is unusual, and should be well known in the United

Why the center of Bristol must be rebuilt is indicated by this war damage map of the so-called "reconstruction area" in which the solid black patches indicate buildings completely destroyed and hatched black patches those seriously damage but capable of repair. The reconstruction area, enclosed by the heavy black line, is shown in more detail in the map on the next page.

States as the starting point of John Cabot's North American exploration trip in 1497. The present harbor was formed in 1809 by the conversion of the River Avon and a branch of the Frome into "the Float," by the cutting of a new channel for the Avon and the formation of two basins protected from the 35-ft. tides by gates. Altogether the water area, at fixed level in the basins, is about 85 acres, and it is entirely surrounded by wharfs. Four dry docks also open into the floating harbor. The city suffered its severest damage from the German attempts to knock out the dock and wharf facilities.

Five miles below Bristol, where the Avon empties into the Severn Estuary, and thence to the Atlantic, the city owns docks at the suburbs of Avonmouth and Portishead. The docks in the city proper have a depth of 22 ft. while those at Avonmouth are accessible to the largest of ships.

The river between Avonmouth and the center of the city flows through a gorge, which is spanned by the famous Clifton suspension bridge designed by I. K. Brunel and noted for setting a new span record of 676 ft. at the time it was completed, about 1860. As there are hills both up and downstream of Bristol, the town itself lies in a basin-like hollow some four miles in diameter. In any rebuilding all these geographic considerations, as well as the city's shipping economy, have to be taken into account.

Some work under way before war

Just before the outbreak of war, Bristol had begun a basic redevelopment, and had under construction a belt highway around the congested central area of the town, but the bombing made the continuance of the project impractical. In these original plans, departures had to be made from the most logical alignments because of the oldness of the town, and the problems presented by existing structures and streets. If the American reader will bear in mind that the history of the city runs as far back as the time of the Saxons and the Roman occupation, he can get a rough idea of what the city engineer's office was up against.

Now, with a mile square area in the center of the city devasted, the prewar plans are being changed. The ring road, which enclosed an area approximately three-quarters of a mile in diameter, can now be relocated, and a whole street pattern laid out with a modern system of underground utilities—an almost impossible achievement before the bombing.

This inner circuit road, which will have twin carriageways allowing for three lines of traffic in each direction, will have intersecting streets that will divide the central portion of the city into zones. Some new streets are being created while some of the old thoroughfares, like Victoria Street and Temple Way, are being greatly widened. With an eye to traffic flow, the central part of the city will be so divided that business buildings will be in one area, shopping stores in another, and public buildings in still another. An accompanying map shows just how the city planners have worked out this zoning. It is to be especially noted that industry is practically eliminated from the central portion of the town.

In replanning, special consideration is being given to bus operations, and car-parking provisions call for the handling of 6,500 cars at a time, 2,000 in private garages, and 4,500 on city sites. Plans have also been made to set up temporary shopping accommodations to tide over the needs of this bustling city of 400,000 population during the early stages of reconstruction. Special funds, discussed later in this article, have been set aside to underwrite the cost of these temporary stores.

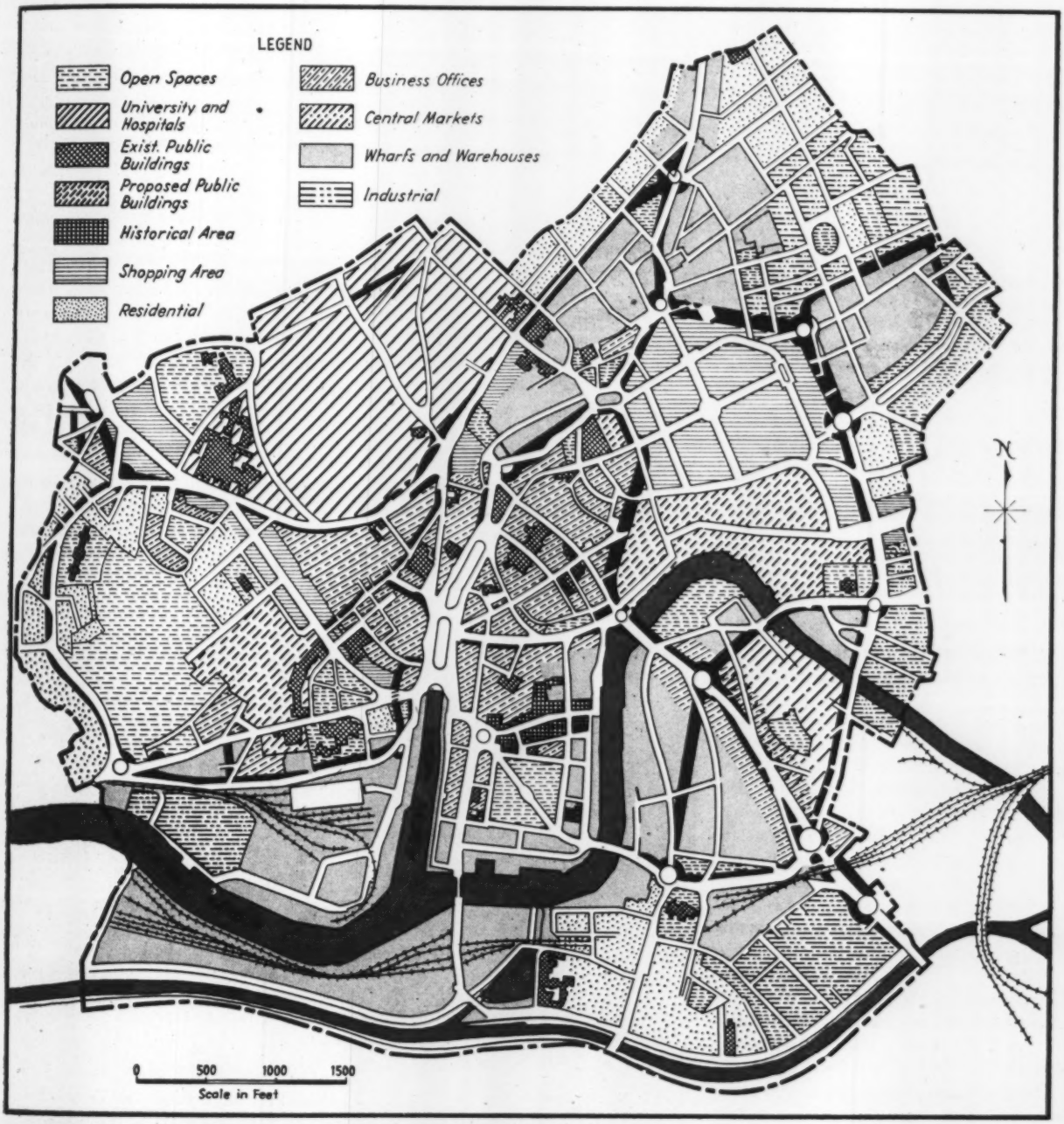
The plans, which have been formulated by the city engineer's office, working under the direction of the planning committee of the Bristol city council, are not confined to the central section of the city, but embrace a regional area of about 150 square miles. For example, the city council has taken over the development of so-called "housing estates," which are designed to be well-knit neighborhood units for population groups of eight to ten thousand. Each such unit is planned as a small town, complete with shops, public buildings, schools, churches, and theatres of its own. As far as possible, each housing estate will be surrounded

by a quarter mile wide strip of open land. Locations will be made with an eye to easy commutation to the city proper and to working areas.

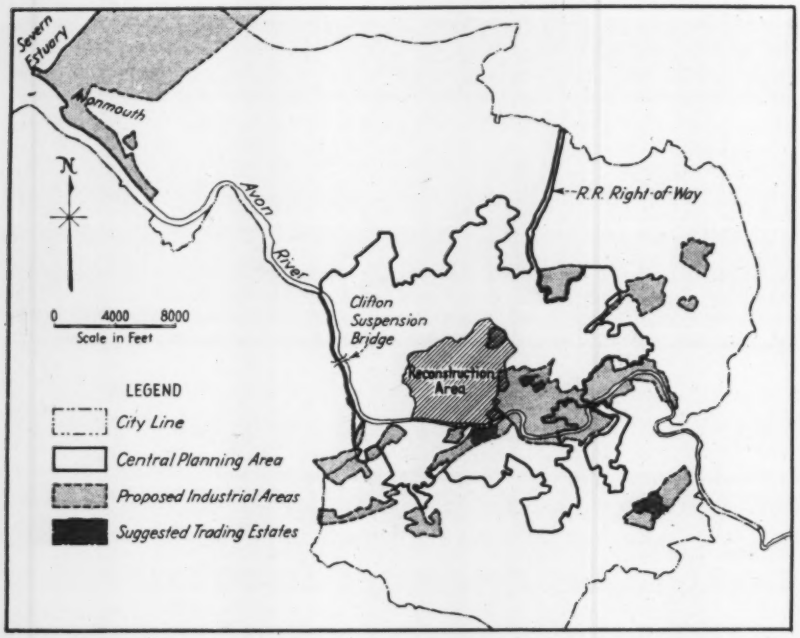
In the same way, five separate "trading estates" are planned to accommodate the industrial overflow. These sites, some of which are shown on the map on the next page, have been selected by local manufacturers. It is proposed that the land be owned by the city, which will take on the responsibility of seeing that all essential services are provided, while the buildings themselves will be privately owned.

The creation of the trading estates will make more room available in the center of the city, and will allow for the moving of industries that did not rightfully belong in the business district. A priority system of land allocation adjacent to the docks and railway tracks has also been worked out.

All the planning is on a long-range basis and takes every possible angle of the city's economy into consideration. For example, before the war, Bristol imported ten times as much goods as it exported. Looking toward a correction of this uneven trade balance, the city plans call for one of the trading estates to be established adjacent to the city-owned docks at Avonmouth. Such a step, it is felt, will encourage exporting industrialists to build factories there.



Reconstruction area of Bristol in which new streets are to be cut through and old ones widened, as shown in solid black, and in which various sections have been earmarked for special uses, such as open spaces, public buildings, university and hospital buildings, business offices, industrial, residential and shopping. The wide streets (in white) were in the prewar plan.



Areas (shown shaded) are set aside for industrial and business development and are located for the most part at the edge of or outside the "central planning area", in the center of which is the reconstruction area. The city boundaries include many suburbs, among them Avonmouth, where a large industrial area is to be located.

In carrying out reconstruction steps, the city is working hand and glove with the British Ministry of Town and Country Planning, which, in turn, is working on the problems of the communities making up the rural area surrounding Bristol. At the moment of writing, the city council is awaiting government approval of an application for a declaratory order, which would empower the city to acquire the land within the central area. Two million pounds (approximately $8,000,000) has been set aside for the acquisition of land, including sites for the erection of temporary shops. An additional 250,000 pounds ($1,000,000) has been earmarked for temporary store construction, and another 100,000 pounds ($400,000) will be used for the acquisition of land for the development of the Bedminster trading estate and 25,000 pounds ($100,000) for preliminary installation of services.

To finance the city-wide project, Bristol is counting on government grants that will be forthcoming under the Town and Country Planning Act, 1944, which provides for funds for war damaged areas. It is anticipated that these grants will more than cover the annual loan charges. Rents from the temporary shops also will provide a revenue source.

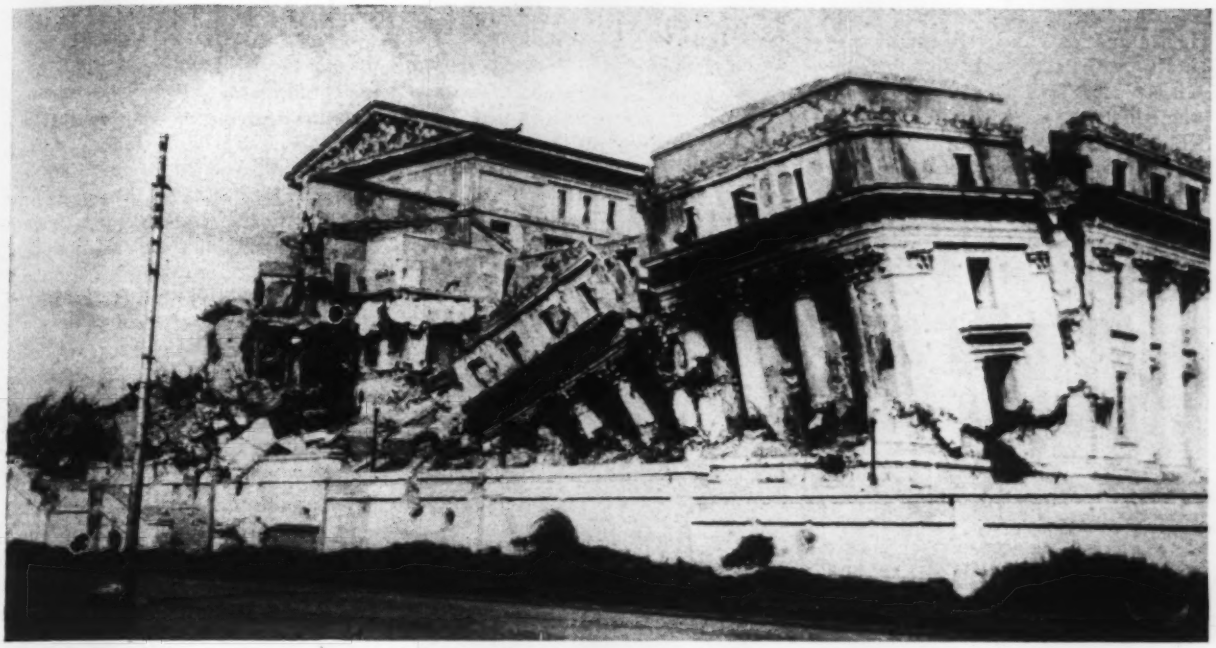
Bristol is not the only city in England working on major reconstruction projects. Coventry, Birmingham, Plymouth, and Southampton, to name but a few, also have their engineers hard at work at the drawing boards.

Although the manner in which the necessity for reconstructing Bristol, and other British cities, was one of the tragedies of the war, the fact that it did happen has given many a city-planner the long-dreamed-of opportunity to rebuild his town in a manner that should serve its needs for many years to come.

Model of a Satellite Town Proposed in Greater London Plan

As part of a long range postwar redevelopment plan for the Greater London area prepared by Patrick Abercrombie, professor of town planning, University College, London, a number of satellite towns are included as a means of relieving the population and traffic density in the central city. Typical of these is the satellite town of Ongar, shown here in a model made by the Ministry of Town and Country Planning.

The town of Onger provides for a population of 60,000, and includes a commercial center and a factory area, in addition to the residential section. The factory area is in the foreground of the accompanying picture on either side of the railway which passes in a tunnel under the commercial center just beyond.



Ruins of the once-stately Legislative Building, the Philippine capitol, symbolize the destruction of Manila

Rehabilitation of Ruined Manila

Harold W. Richardson
Western Editor, Engineering News-Record

***Editor's Note**—As guardian and protector of the Philippines for half a century, the American public is more interested in the fate of Manila than in that of any other city devastated by the war. The emergency rehabilitation of Manila—and that is all that has yet taken place—was carried out by the U. S. Army Engineers who brought orderliness, health and safety to the ruined city. While the ultimate reconstruction of Manila is still undecided, pending study of various physical and financial plans, the job of permanent rehabilitation will carry on from where the emergency temporary job left off.*

THE RECAPTURE OF MANILA last spring was, of course, a major combat operation, but its occupation and emergency restoration have been largely an engineering job. By the time our troops had cleared out the Jap defenders, sending most of them back to their ancestors, the city was in ruins. The once beautiful gem of the Orient was without transportation, power, water or communications. Few buildings in the downtown, business and government areas escaped demolition or severe damage in the heavy artillery shelling of the bitter fighting, and those few were laid waste by the Jap torch as a desperate final gesture before annihilation.

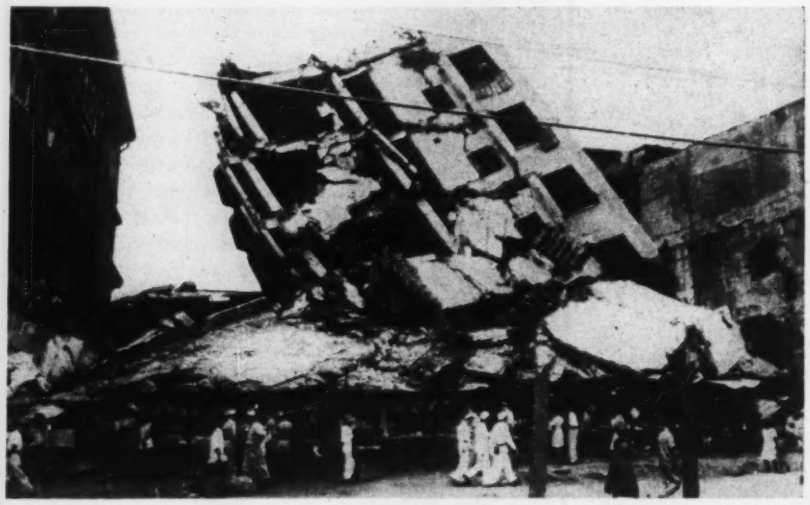
Though designed to resist earthquake stresses, the stately government buildings and other heavy structures were no match for the incessant shelling of our big artillery. Along the north bank of the Pasig River, which divides the city, the formerly crowded and busy main business district is strewn with rubble, punctuated by twisted and battered frames of the more substantial buildings. Already sheet metal stalls and makeshift stores have sprung up amid the ruins, with business almost as usual. Four temporary bridges span the Pasig, replacing the original four blown up by retreating Nips.

Across the river to the south the demolition is even more complete. Here were once the stately municipal and government buildings, every one now shell-shattered and fire ravaged. Here stands the famous Manila Hotel, partly burned and shell pocked, but rehabilitated sufficiently to serve as a billet for high ranking military personnel—though the service has dropped from its former high standard. All of the beautiful buildings along Dewey Boulevard, skirting the bay shore are wrecked, including the Army-Navy Club and the High Commissioner's residence. The once divided boulevard was stripped of its palm fringes and ornamental lights, and the center parkway was graded down by the Japs for a fighter plane strip.

The ornate postoffice and opera house are fire-gutted skeletons. Shell holes ventilate the tall tower of City Hall. Most pathetic of all ruins, though, is the magnificent Legislative Building, a massive structure built on a high terrace to dominate that part of the city. Its tall concrete columns and ornamental facades are slumped into twisted wreckage, and the center area and various wings have shed whole sections of walls and floors. The nearby Police Building and other public structures are similar in their desolation of twisted concrete and steel frames.

So much for modern Manila. Worse, if possible, is the destruction of Intramuros, the old Walled City around which the new city was built south of the Pasig. Inside the thick, centuries-old masonry walls in the ancient churches and the catacombs, the Japs made their last futile stand. Our artillery bombardment of this area exceeded in fury anything thrown against the Japs in the whole Pacific theater. The result was complete destruction of Intramuros. More than 23 square blocks have been cleared for troop and storage space. Some 200,000 cu. yd. of rubble was hauled to North Harbor for emergency waterfront fill. Eventually the city will turn the cleared area into a park, surrounded by gaunt walls as an ever-mindful war memorial. The ancient walled city, it is stated, will never again be rebuilt.

Clearing out dangerous spots was a big job early in the occupation. Here a bulldozer razes a damaged wall and fills in a gaping catacomb in the old walled city.



Point-blank heavy artillery fire collapsed this six-story concrete office building in the main business district on the north side of the Pasig River. Sidewalk stalls have been dug into the ruins from which business is conducted almost as usual.

Engineers take over

Into these ruins came the Army Engineers to make the city safe and habitable. Long before the fighting ceased they were busy wrecking dangerous walls and structures, clearing the streets, putting airfields into use, restoring vital water and power services, building hospitals, camps, storage and office space, and rebuilding the battered waterfront for emergency shipping operations.

They threw floating bridges across the Pasig for the onrushing troops to pursue the Japs; later they replaced these with fixed structures. Networks of military pipelines were laid on the ground for water, gas, and oil. The engineers found a shortage of chlorine and ferric chloride for water treatment, so soon set up means to manufacture these vital materials. Lack of lumber and cement for emergency construction was met by organizing logging and lumbering crews on Bataan, and taking over a cement plant in Cebu. Storage tanks for 4,000,000 bbl. of gas and oil were hurriedly erected in newly-cleared jungle on Bataan. Railroad and highway bridges on the city's main access routes had to be replaced after demolition by the enemy. There was no rest for the Engineers in the recapture and occupation of Manila.

Serious damage to the water supply system was averted by a photo finish race between units of the First Cavalry in taking the Balara filter plant before the Japs could blow it up. Several tons of TNT had been distributed around the plant as mines, wired to the power supply, and the Japs had warned civil-

ian employees to clear out by 3:30 p. m., the time set for demolition. A few minutes after 3 p. m. the Cavalry captured the plant and immediately disconnected the power, thus saving the filters.

The water system consists of Ipo Dam, a main storage reservoir on the Angat River 27 miles from the city. A combination tunnel and covered conduit 14 miles long leads to another storage reservoir at Novaliches. From here more tunnels and covered conduit lead the water 5 miles to Balara filters, 8 miles from the city. There is a small covered compensating reservoir between the filter plant and the city distribution system. Except for two pumping plants serving high sections of the city, the main distribution system is by gravity flow.

During the early days of the occupation we had control of only that part of the water system from Novaliches Reservoir to the city. The Japs still held the Ipo Dam and reservoir, but there was sufficient storage in Novaliches to meet all demands for some time, though water had to be rationed. Though the Japs had plenty of time and opportunity to destroy Ipo Dam, they failed to do so. One explanation is a remark by a captured Jap officer: "We were sure we would be back in Manila in three months."

Last of the Jap strongholds in Manila was the Intramuros, the old Spanish walled city. Before the enemy could be routed out the entire area had to be completely devastated by shellfire. Some of the rubble from this section was hauled to North Harbor for waterfront fill.

Typical of the damage to civic and governmental buildings is that of the Commonwealth police building. Steel framing in the main part seemed to withstand heavy shellfire better than did the ornamental concrete columns at the corners.

Water system repaired

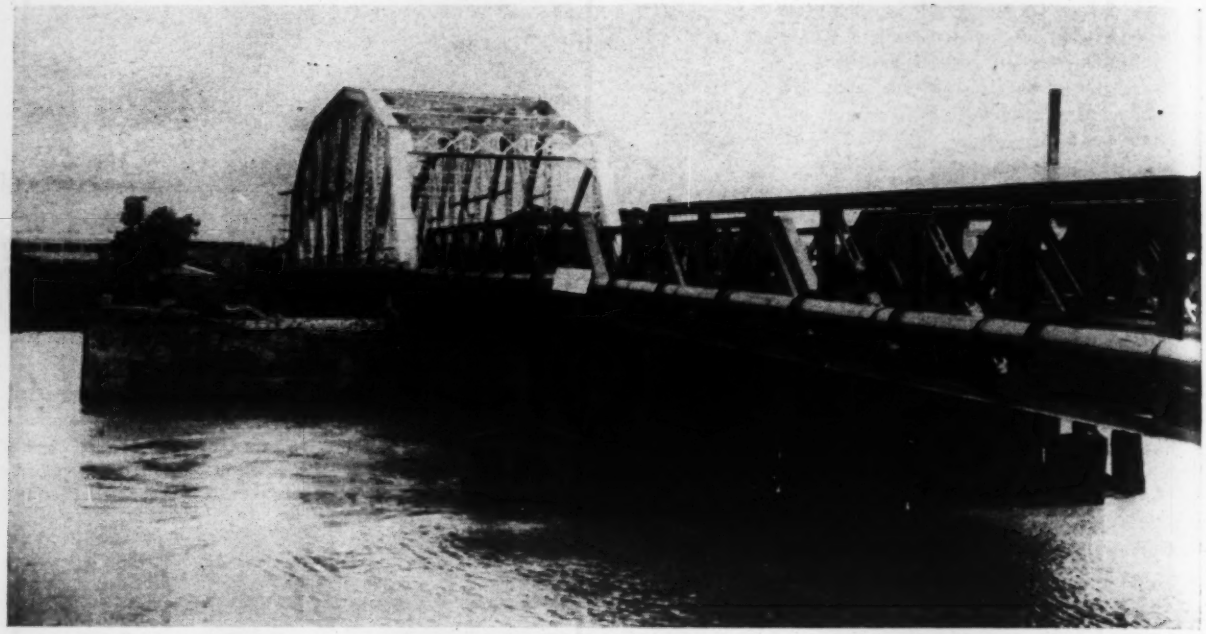
However, considerable damage was caused to the conduit and distribution lines. The conduit had been blown in several places, and all river crossings were out because the lines had been carried on bridges demolished by the Japs. Major L. H. Scott, formerly superintendent of filtration for the Oklahoma City waterworks, was handed the job of rehabilitating and operating the water system. He rounded up many former employees of the Metropolitan Water District, which helped a lot. At first he had to haul water into the city in tank cars and trucks for emergency supply.

He found the distribution lines, mostly cast-iron pipe with leaded joints, badly shattered by shellfire. Records up to Oct. 6 show that 10,644 breaks had been repaired. There was a small stock of pipe and repair parts on hand, but in many instances the repairs were improvised. Temporary military pipelines laid on the surface and on floating bridges across the Pasig eased the water shortage in the early days. Taps off these lines had to be made with torch cuts and welding.

The Balara filters, of the rapid sand type, have a designed capacity of 50 mgd. By overloading, they now treat 65 mgd., but as the daily demand has risen to 74 mgd., part of the supply must be passed around the filters. All water is chlorinated at the rate of 2 ppm., so no harm results from bypassing part of the supply.

A critical shortage of chlorine and alum for water treatment was met by manufacturing these materials at the filters. A chlorine plant, purchased from a sugar mill, was moved and set up ready for operation in four days. Salt for the process was obtained by electrolysis of seawater. Additional chlorine is obtained from a plant built for the Japs to produce soaps and perfumes. Ferric chloride, as a substitute for alum in the coagulation tanks, is made from scrap iron at this latter plant. Manufacture of both chlorine and ferric chloride was handicapped by lack of carbon electrodes, but by improvising the operators kept the filters in operation until supplies could be rushed from the States.

Most of the system has now been revamped to the stage of satisfactory operation, and the Army will soon turn it back to the water district. In the bombardment of the district office buildings all records and maps were destroyed. This necessitated complete



All four bridges across the Pasig in the downtown section were destroyed by the retreating Japs. One span of the Ayala bridge was hurriedly replaced by two shorter spans carried on a temporary pier in order to get a main water line into service as soon as possible. Several temporary bridges were also built in outlying sections.

new surveys of the distribution system, during which lines were found that even the oldest employees never knew existed, though some had been laid by the Japs during their occupation. The Japs apparently ignored all maintenance for three years, so the packing was disintegrated on about half of the valves. Both left and right handed valves were discovered in the system, with no indication of which was which. Therefore, to insure at least some water getting through, the valves were half opened at first until the stems could be uncovered and the direction of turn noted.

Most of the meters were found to be a poor grade Jap make, practically worthless. The remainder consisted of every make in the world, including American, Swiss, German and Swedish. Enough good meters were put back in service by Oct. 1 to permit a start on billing of customers. The Metropolitan Water District is now adopting AWWA standards for meters, taps, goosenecks and other connections.

Electric motors and pumps were obtained from every available source to replace damaged units in the high service pumping plants. Practically all the concrete mains leading from these plants had to be replaced. In all, some 100 miles of new lines were laid, including those in newly-occupied military areas not previously served by the municipal system. In a few cases new lines bypassed areas where existing lines were damaged beyond repair.

Sewer system badly damaged

The Metropolitan District is also responsible for the storm and sanitary sewer systems, so Major Scott added these to his engineering responsibility. As most of Manila lies on flat terrain, just above sea level, all sewage must be pumped to keep the sewers within reasonable depth. Despite numerous pumping plants, the sewers run from 15 to 18 ft. deep, with groundwater level only a foot below the surface. The sewers, all vitrified pipe, were badly damaged, and the pumping stations and equipment were found to be completely wrecked. The more important lines were restored as rapidly as possible, and portable generating sets furnished power for makeshift pump units. Disposal of sanitary sewage, all untreated, is through a 42-in. cast-iron outfall pipe extending 2,000 ft. into the harbor. This line was broken by a sinking ship, but is now being repaired by divers. Rehabilitation of the sewers, however, is lagging behind that of the waterworks.

Two destroyer escorts, with a generating capacity of 3,700 kw. each, army portable generating sets and hastily-repaired private industrial plants kept the city in power during the early days of occupation, for the public power system was completely out. With the distribution system completely disrupted, the power supply suffered much more than did the water supply.

Manila depended on both hydro and steam power for its electricity. The Manila Electric Co., which distributed all power within the city, operated a steam plant of 29,500 kw. capacity on nearby Provisor Island, and the Botocan hydro plant of 16,000 kw. some 50 miles away. It also received power from the National Power Corp., the Philippine version of a TVA, which had completed its first installation at the Caliraya hydro plant in 1942. A small amount of power was also furnished by the Philippine Power Co. serving the surrounding countryside. The main steam plant was almost completely destroyed, and the two hydro plants were put out of operation by Jap sabotage of the transformer stations, which, with the loss of distribution and some transmission lines left the city wholly without electricity.

First job of the army engineers was to string emergency distribution lines to vital points so power from the warships could be utilized. Next, they rehabilitated the generating units of the Balintawak brewery for a 140-kw. sup-

ply, and obtained an additional 900 kw. by hastily repairing the generators at the Philippine Mfg. Co. plant. Several diesel-driven 30 and 50-kw. portable plants were set up where a dependable 24-hr. supply was imperative, such as hospitals and command headquarters. The emergency work was under the direction of the electric branch of the General Engineer District (GENED), headed by Capt. V. L. Klesath.

The hydro stations and private plants have been restored sufficiently to meet present domestic, military and industrial needs. Rebuilding of the steam plant is hampered by difficulties in obtaining equipment. Reconstruction of the distribution lines is proceeding according to needs, but full restoration awaits decision as to the rehabilitation of the city. The engineers are now doing only such work as is necessary for the army, all other restoration being by the local utility forces.

Troops entering Manila found the approach roads and streets mined, blocked with debris and barriers and all bridges destroyed. Inside the city, as the troops advanced, bulldozers cleared lanes through the rubble; later the debris was loaded and trucked away to open up the main streets.

All four bridges over the Pasig in the downtown section were blown up by the retreating Japs. Two floating treadway bridges were hurriedly thrown across the river for access to the south side. These were later replaced by temporary spans at the sites of the original structures, and these are still in use. Several temporary bridges also had to be built in outlying sections of the city.

Port facilities wrecked

Between Jap sabotage and American artillery fire, the extensive waterfront along Manila Bay was left in shambles, and the bay was strewn with some 300 sunken ships of all sizes. Rapid restoration of port facilities, sufficient to handle 125,000 tons of cargo per day, was imperative for occupation operations and for relief of the city. The job was handed to Col. P. Z. Michener, area engineer for the port of Manila. With 1,800 engineer troops and 2,000 Filipinos, 80 divers, 5 dredges, 3 port repair ships, and a fleet of floating pile drivers, cranes and work barges, he completed his assignment in 5½ months, two weeks ahead of schedule.

The harbor is divided into North and South areas by two breakwaters fanning out from the mouth of the Pasig. In South Harbor, the larger of the two, the engineers rebuilt eight piers, including famous Pier 7, whose covered 1,470-ft. length made it the longest of its type in the world. Piers 3 and 5 in this area are each 1,000 ft. long; the other five are 500 ft. Two new oil pipeline jetties were also built in South Harbor. Pier 7 was split in three places by 50-ft. gaps blown across its full width by the Japs. These gaps caused little delay in restoring the pier to use, however, for the engineers speedily bridged the gaps with six 80-ft. Bailey spans. Four more similar bridges closed openings in other piers.

Waterfront restored

In North Harbor the damage to piers was repaired by filling. Nearly 200,000 cu. yd. of rubble from the ruins of Intramuros was hauled by truck for this purpose.

In the restoration of the waterfront to emergency operation status 8,750 piles were driven, 500 tons of steel fabricated, and 3,240,000 cu. yd. of material was dredged from the harbor and lower river to permit deep draft navigation. No attempt was made to remove the sunken ships.

The military has rehabilitated and leased all available space in buildings possible to restore to usefulness, a deal involving 650 properties covering 4 million sq. ft. There is very little space left for normal civilian business, which, of course, was completely disrupted by the wrecking of the city. Business "as usual" in Manila will be a long time returning.

In addition, the army has built 4 million sq. ft. of covered storage and 34 million sq. ft. of open storage in the Manila area, and has also built nearly 800,000 cu. ft. of refrigerated cold storage facilities. These last vary from numerous packaged units of 1,800 cu. ft. each to a large refrigerated warehouse leased from a brewery and put back into operation after being severely damaged.

Buildings of the Far Eastern University have been restored as headquarters for AFWESPAC (Army Forces Western Pacific). Several large Australian type warehouses of light con-

Jones Bridge, busiest of the four temporary crossings of the Pasig in downtown Manila, is made up of two lanes of double-double Bailey bridge spans. Across the river is the fire-gutted postoffice.

For the first time, army engineers erected all-welded oil and gas tanks on Bataan for a big tank farm to serve the Manila area. The farm was swamped out of heavy jungle growth prevalent in this area.

struction, 100x500 ft., with open sides, have been erected for general office space. Military personnel is housed in leased homes, in camp buildings of all types, and in tents. Several hospitals were built to accommodate a total of 14,000 beds.

Because of lack of ground space and congested harbor facilities at Manila, a huge tank farm for petroleum products has been built on Bataan Peninsula at the outer end of the bay. The tanks, mostly 40,000-gal. all-welded, of a new type for the army, have a total capacity of 690,000 bbl. For distribution of oil and gas to Manila and throughout the area, 179 miles of military pipeline have been laid. Jetties to carry pipelines between tankers and the tanks had to be built at Bataan, along with a pier for accommodating ships handling petroleum products in drums.

Materials produced locally

All of this construction, including the temporary timber bridges, required lumber and cement at a faster rate than these materials could be shipped in, so the engineers set up extensive logging operations at Bataan and elsewhere in the islands, and took over a cement plant at Cebu. The 1002nd Engineer Forestry Bn. was organized for the logging operations, commanded by Lt. Col. J. E. McCaffrey and made up of experienced lumbermen. They operate 26 sawmills, and a Scottish coastal vessel has been equipped as a floating repair and service shop for the sawmills.

On Bataan alone the engineers are cutting about 2½ m.fbm. lumber per month. All types of wood are obtained, varying from light balsa to mahogany and other hardwoods that weigh as much as 75 lb. per cu. ft. Logging camps and haul roads had to be swamped out of the jungles to get at the vast virgin stands of trees. Mountainous terrain and wet weather handicap the operations.

The cement plant at Cebu, jointly operated by the army and the previous management, is turning out about 25,000 bbl. per month. Cement is sacked in paper-lined rattan bags by native women.

Future of city uncertain

All of the rehabilitation of utilities, streets, bridges, buildings and the waterfront by the army is, of course, the start of reconstruction of the city. However, nothing has been done by the army beyond that required for occupation operations and the prevention of disease.

The ultimate fate of the city depends upon several important decisions by both the Americans and the Filipinos. Congress must decide just what our responsibility is in respect to restoring a city wrecked, yet also liberated, by our forces. Are we to appropriate funds for further reconstruction by the army engineers? Or are we to provide funds, either by gift or loan, to the Filipinos for them to do the work themselves? Or are we going to declare we have no interest in the city or the islands after the need for military occupation is over? Will granting of independence to the Filipinos scheduled for next July 4th, have any bearing on these decisions? Only Congress can provide the answer to these questions.

The people of Manila must decide for themselves whether they want to rebuild the city on its present site. Several alternate proposals have been suggested, none acted on definitely as yet. One is to move the business and governmental and part of the residential districts to a new location in Quezon City to the northeast, and then convert the present wrecked downtown section into industrial and port sites. Another scheme contemplates moving the entire city to a new location, a plan that has little support, however, and seems illogical. Still other plans call for moving only the civic and governmental areas to nearby Quezon City.

Responsible military authorities are urging the establishment of a competent planning commission to study the problem. Otherwise, they feel, the city will be rebuilt in haphazard fashion, a procedure already under way, which would result in an unsightly and inefficient layout. Regardless of what plan is adopted, clearing away the debris of completely wrecked buildings, restoration of utilities to adequate service, cleaning up the harbor and rebuilding the waterfront alone are four big jobs that will take years of hard and expensive work.

Army engineer personnel

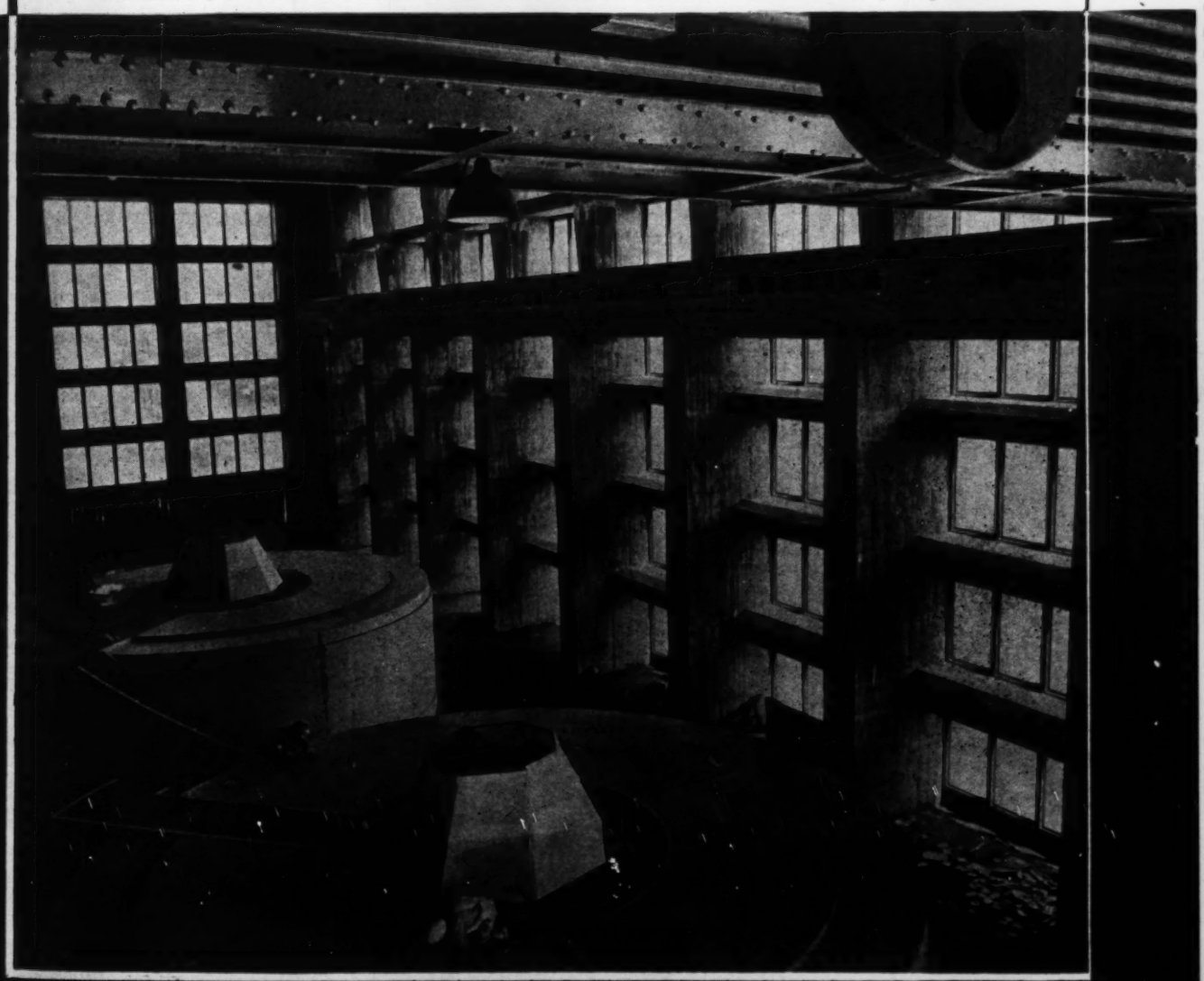
It is impossible to list all of the army engineers holding responsible positions on the work above described. Manila and all the Philippines are under the command of Gen. Douglas MacArthur, for whom Maj. Gen. Hugh J. Casey is chief engineer. Lt. Gen. W. D. Styer, commanding the Western Pacific Forces, and his deputy, Maj. Gen. Edmond H. Leavy, are both regular engineer officers. Maj. Gen. L. J. Sverdrup was in charge of all construction forces at one time, but has now left the service. Maj. Gen. E. G. Plank is in charge of Base X, which includes construction work in Manila. Brig. Gen. L. D. Worsham is chief engineer for AFWESPAC under Styer. Col. S. N. Karrick is head of GENED, and Col. R. D. Rindlaub is representing Gen. Casey at Manila while the latter is in Japan with Gen. MacArthur.

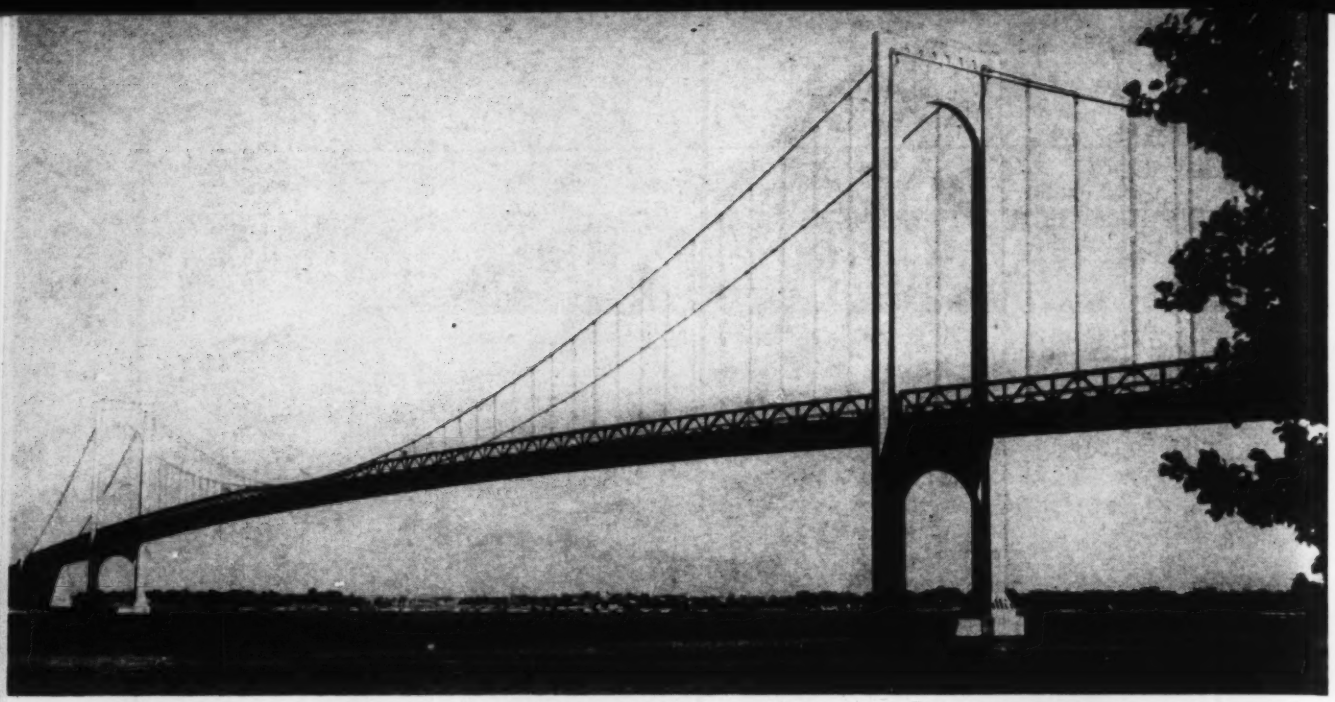
STATUS OF MAJOR PROJECTS—1946

BRIDGES • WATER SUPPLY • SEWAGE DISPOSAL • BUILDINGS
POWER • IRRIGATION • FLOOD CONTROL • TRANSPORTATION

In choosing the major projects to be described in this section, consideration was given to those jobs that seemed to offer the most interest and appeared to have a high prospect of being under construction in 1946.

Power station at TVA's Fontana Dam houses three 67,500-kw. units, two of which are already in operation.





Artist's alterations to photograph of Bronx-Whitestone Bridge show how the structure will look when stiffening trusses are added on the top of existing stiffening girders to increase the aerodynamic stability. Other work includes elimination of sidewalks and widening of roadways.

BRIDGES

TACOMA NARROWS BRIDGE—After extensive experimental work in a special wind tunnel, designs have been made for a suspension bridge to replace the one that collapsed in Tacoma Narrows Nov. 7, 1940. The new design provides for a main suspension span of the same length (2,800 ft.) as the original bridge and will use the same concrete piers. However, the consideration given to aerodynamic forces, it is believed, will hold all vibration within safe limits. The plans have been completed and it is expected that bids may be called at an early date.

BRIDGE AT MEMPHIS—The largest bridge job under way in this country is a highway structure across the Mississippi at Memphis that is expected to cost $10,500,000. The substructure consists of an abutment on the Memphis side, a shallow pier and two deep piers in the river, followed by four deep piers and a long pile trestle across the flood plain on the Arkansas side. The superstructure will be a cantilever with a channel span of 790 ft. Work started in August on piers on the Arkansas side, which are built in caissons and sunk by open dredges. A willow mattress has been sunk at one of the river piers and floating caissons will be constructed during the winter for both of the river piers. The caissons will be launched and sunk through the willow mats, as soon as low water conditions prevail.

WHITESTONE BRIDGE—Contract was let and work begun late in 1945 to increase the aerodynami stability and widen the roadways of this 2,300-ft. span suspension bridge at New York. New trusses 14 ft. deep are to be installed on top of the existing 11 ft. deep stiffening girders, the latter to act as the lower chords of the rebuilt stiffening members. The 27.5-ft. roadways either side of a 4-ft. center strip are to be widened to 30.8 ft. by eliminating the sidewalks at either side.

NEWARK LIFT BRIDGE—Foundations were completed in 1945 ready for superstructure erection on a new Passaic River highway crossing at Newark, N. J., to replace the existing Bridge St. span. A project of the New Jersey State Highway Department, the new bridge will include a 200-ft. vertical lift span providing 35-ft. clearance in down-position, and will accommodate two 36-ft. separated roadways and two 6-ft. sidewalks. The piers were sunk to a maximum depth of 60 ft. under compressed air.

CHICAGO BRIDGES—Chicago's calendar of bridge construction for 1946 includes four large bridges: South Canal St., North State St. and Van Buren St. bridges over the Chicago River and one at 130th St. over the Calumet River. Substructures for the South Canal St. and North State St. bridges were completed before the war. Erection of their superstructures will be resumed early this spring. Contracts for the other two bridges are expected to be let next month.

South Canal St. Bridge—Two new departures from standard bridge design in Chicago will be incorporated in the South Canal St. bridge, which is to be a 224-ft. clear span, double-leaf trunnion bascule. One is that an open steel grating will be used instead of reinforced concrete for the 44-ft. roadway and 11-ft. sidewalks of the movable span. The other is that power for operating the bascules will be applied through an oil-filled hydraulic system that will simplify the electric control operations, yet afford a more positive control of the huge moving mass. The original $1,650,000 estimated cost of the South Canal St. bridge has been increased to $1,800,000 in anticipation of the increased cost for the remaining unawarded work.

North State St. Bridge—The North State St. bridge, estimated to cost $2,200,000, will provide two 11-ft. sidewalks and two 36-ft. roadways separated by a 5-ft. center island. It will be a 210-ft. clear span, double-leaf trunnion bascule, containing three lines of rail-height type trusses.

Bridge at 130th St.—The new bridge at 130th St., one-half mile west of Torrence Ave., will be a 219-ft. clear span fixed bridge with 28-ft. clearance above the Calumet River. Estimated to cost $800,000, it will carry a 44-ft. roadway and two 11-ft. sidewalks.

Van Buren St. Bridge—At Van Buren St. the city will construct a temporary swing bridge required to minimize interference to traffic during construction of the proposed Congress St. bridge over the Chicago River that will be a part of the Congress Street Expressway. In the construction of this temporary bridge an old swing span, which was built originally at South Halsted St. and later re-erected at South Ashland Ave., will be used. Total estimated cost of the temporary bridge is $350,000.

WASHINGTON, D. C. BRIDGES—A plate girder bridge, costing $4,500,000, with a 854-ft. main crossing over the Anacostia River on South Capitol St. in Washington, D. C., will soon be under way, with a contract for foundations already awarded. Other large bridges expected to start in the District of Columbia are: Replacement of the existing 14th St. Highway Bridge over the Potomac, at a cost of about $7,000,000; a $2,275,000 elevated highway on K Street connecting with Key Bridge, and a $2,000,000 underpass at Dupont Circle.

TERMINAL ISLAND, CALIF.—Navy Department has approved construction of a $14,000,000 bridge and freeway connecting Terminal Island with Long Beach, replacing a timber swing-span bridge.

BUILDINGS

GENERAL MOTORS TECHNICAL CENTER—Construction of a technical center near Detroit, Mich., devoted to industrial research is planned by General Motors Corp. to bring together at one place and at a location physically close to the manufacturing divisions, the research and experimental development facilities of the company. The various buildings—administration, advanced engineering, research laboratories, process development and styling section—will be grouped around a central esplanade within which will be a 7-acre lake. To be erected as soon as materials are available on a site 1½ mi. long and about ½ mi. wide, the buildings will be of contemporary functional architecture.

GOODRICH RESEARCH CENTER — Construction of a $2,000,000 research center for the B. F. Goodrich Co., Akron, Ohio, was started in December near Brecksville, Ohio. To be erected on a 260-acre tract, the research laboratories will be composed of five separate, completely air conditioned buildings. The structures are being designed and built by company engineers.

JOHNS-MANVILLE RESEARCH CENTER —The first unit of a $40,000,000 research project near Bound Brook, N. J., for the Johns-Manville Corp. is now under construction. It will cost about $2,000,000, and in addition to research laboratory facilities will also provide ten experimental factories under one roof. Ultimately, the project will consist of a group of six buildings located on a 93-acre plot of land—a research laboratory and administration headquarters, two combination laboratory-factories, a research engineering and machine shop building, a water filtration and waste processing plant, and a garage and stores building. A feature of the construction used is the flexiblity of the layout, in that not only are the interior partitions movable but also the rear wall of some of the structures will be removable.

ELECTRONICS PARK—All of the main building of the Electronics Park development of General Electric Company near Syracuse, N. Y., will be ready for occupancy late in 1946, dependent, however, upon the availability of steel, other materials and the general labor situation. Buildings to be constructed at a cost of $10,000,000 include reception, administration, laboratory, transmitter, receiver, specialty, restaurant, service, boiler house and substation. Floor space will be in excess of 1,000,000 square feet. A number of structures, including the large transmitter and receiver buildings, will be "ready for steel" about the end of March.

BOSTON OFFICE BUILDING—A 417-ft. high, 26-story office building is being erected in Boston, Mass., for John Hancock Mutual Life Insurance Co. Estimated to cost $15,000,000, the structure will have a 355-ft. tower and two 7-story wings and will provide about 625,000 sq.ft. of working floor space.

NEW YORK OFFICE BUILDING—The $6,000,000 Esso Building being constructed for the Standard Oil Co. of New Jersey in New York City will be a 33-story addition to Rockefeller Center. T-shaped in plan, the structure will have a central tower 90 ft. wide and about 127 ft. deep, rising without setbacks from the second floor level on the south side and from the tenth floor setback on the north side to a height of 424 ft. The building will be fully air conditioned.

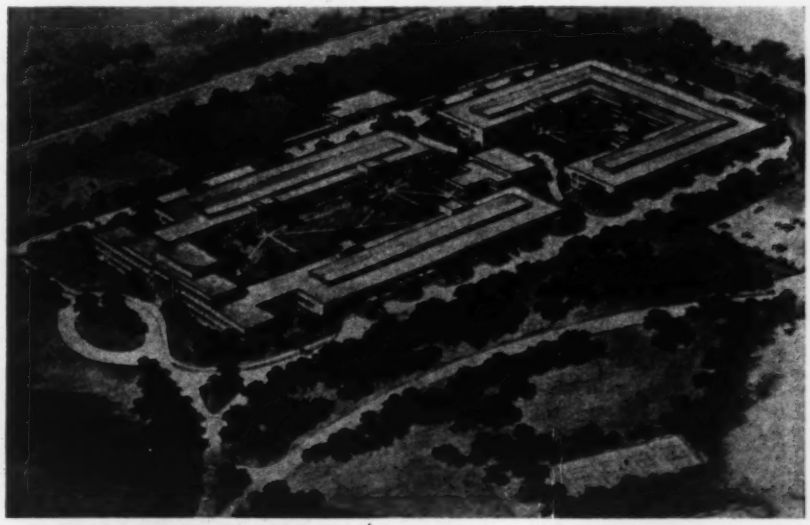
INDUSTRIAL PLANTS, ILL.—Paving the way for a $44,000,000 one-story farm tractor factory between Alton and Woodridge, Ill., International Harvester Co. awarded a $1,100,000 contract for grading and sewer fork at the proposed 375-acre site. Buildings planned include foundry, forge, machine shop, warehouse, and central heating and power plant. At Lockport, Ill., a $15,000,000 catalytic cracking plant is being built for the Texas Co.

RECYCLING PLANT, MISS.—The California Co. plans to construct and have ready for operation by the end of 1946 a natural gas recycling plant near Natchez, Miss., at an estimated cost of $15,000,000. Pending completion of the recycling plant, the company is laying pipe lines from all of the wells in the field to a central point from where the gas will be pumped back into the ground for future use.

VETERANS HOSPITALS — During 1946, the Veterans' Administration expects to award hospital construction contracts totalling $350,000,000. This figure compares with a total of $75,000,000 of work awarded between Jan. 1, 1937, and Dec. 1, 1945. Among the big projects to go ahead are a $11,400,000 general medical and surgical hospital at Pittsburgh; $10,500,000 general hospitals of 1,000-bed capacity at Albany, N. Y., Buffalo, N. Y., and Newark, N. J., and an $8,300,000 project at Oklahoma City. The program also calls for a $6,700,000 hospital at Gainseville, Fla., a $6,100,000 job at Washington, D. C., a $500,000 project at El Paso; and $4,000,000 projects at Louisville, Ky., New Orleans, La., and New Haven Conn. Two large-scale developments now under way and to be pushed to completion are a 527-bed hospital at Lebanon, Pa., and a 1,172-bed project at Tomah, Wis.

ARMY HOSPITALS—The U. S. Army Engineers this year should advance to near completion the 1,500-bed $16,000,000 Tripler general hospital under construction in Hawaii, the project now being about 40 percent complete. Plans for a 1,000-bed Army hospital for San Juan, Puerto Rico, expected to cost between $16,000,000 and $20,000,000, are being advanced rapidly. This permanent hospital program of the Army Engineers also includes consideration of plans, not yet approved, for a 1,500-bed hospital on the West Coast and a similar one on the Atlantic Seaboard. Each of these projects is expected to cost about $20,000,000. At the Fairfield-Suisun Airfield near Sacramento, Calif., construction is under way on a $2,000,000 combination hospital that will provide aerial debarkation facilities. These projects will bring to an end a $624,000,000 hospital construction program of the U. S. Army Engineers. On June 30, 1940, there were only five general Army hospitals and 99 Army station hospitals in the U. S. with 4,063 and 8,568 beds, respectively. By June 30, 1945, there were 64 general hospitals with 164,000 beds, convalescent bed capacity for 50,000 patients, and 200,000 beds in regional and station hospitals of the Army.

REDEVELOPMENT PROJECTS, N. Y.—Workmen are busy on the three sites that the Metropolitan Life Insurance Co. will utilize for the construction of new residential communities to house more than 12,000 families in Manhattan. Demolition of the more than 500 old tenements and other buildings on the 18 blocks of the new $26,462,000 Stuyvesant Town is well under way, and construction is commencing. Stuyvesant Town's apartments will house about 8,700 families at an average

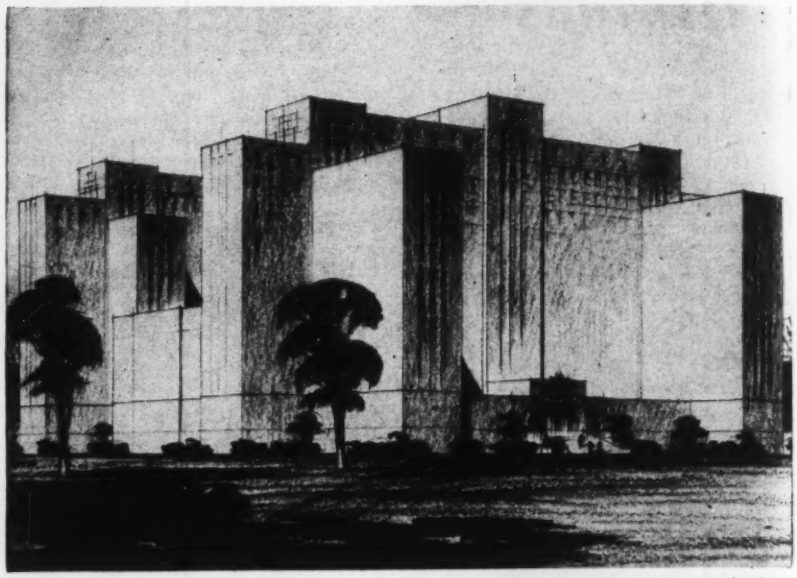


Johns-Manville Research Center near Bound Brook, N. J., will be comprised of six buildings, distinguished for flexibility of space allocation.

rental of $14 a room per month. This community as well as the $3,400,000 Riverton project, which will provide 1,250 apartments at an average rental of $12.50 a room, is being built by the company in agreement with the City of New York under the terms of the Dedevelopment Companies Law of the state. Large-scale demolition on the Riverton site is substantially completed, and steam shovels and pile drivers are now at work. Demolition is also in its last stages at the $7,919,000 Peter Cooper Village project, which will house 2,500 families at rentals that, while not yet established, will be higher than those of Stuyvesant Town, its neighbor on the south. None of the new buildings planned in the three projects will be ready before 1947.

LOW-COST HOUSING, NEW YORK—Construction on 11 New York City Housing Authority projects is expected to start in 1946. The projects and approximate development costs are Brownsville, $8,167,000; Amsterdam, $7,091,000; J. W. Johnson, $9,974,000; Jacob Riis, $12,000,000; Marcy, $11,186,000; Abraham Lincoln, $8,836,000; Lillian Wald, $12,902,000; Gowanus, $6,738,000; Morrisania, $10,849,000; Alfred E. Smith, $16,361,000 and Astoria, $7,644,000. Work on the $3,860,000 Elliott development started Dec. 20, 1945, and initial occupancy is scheduled for Oct. 20, 1946. The Brownsville houses are also expected to be ready for initial occupancy in October.

RESIDENTIAL DEVELOPMENTS—Among the outstanding housing projects throughout the country are the following: 800 residences at San Mateo, Calif., for San Mateo Investment Co., $10,000,000; a $9,000,000 project at Natick-Framingham, Mass., by United Reis Homes, Inc.; 650 frame and concrete-block houses on 200 acres at Corte Madera, Calif., by Madera Gardens Development Co., $7,000,000; 850 dwellings on 108 acres at Los Angeles, Calif., by R. S. Diller, $6,000,000; and 900 two-story, single family houses, 800 apartment units, 700 garages, stores and office at Baltimore, Md., by Loch Raven Corp., $6,000,000. At Houston, Tex., an $11,000,000 apartment hotel, swimming pool, community and residential center is being constructed for Glenn H. McCarthy, Inc. A hotel being built for Plaza Terrace Hotel at Cincinnati, O., is estimated to cost $8,000,000.



General medical and surgical hospital to be built for the Veteran's Administration in the Pittsburgh, Pa., area, providing 1,248 beds and costing about $11,400,000.

Abraham Lincoln houses of New York City Housing Authority, a low-cost development in northern Manhattan, will be under way in 1946.

SEWAGE DISPOSAL

LOS ANGELES, CALIF.—Sewage discharged into the ocean by Los Angeles with resultant serious pollution of beaches brought legal action by the state board of health to put a stop to the health menace. Reports on possible remedies have been received, and the city has approved a $10,000,000 bond issue. Pending the proposed construction of a large treatment plant at Hyperion, plans were under way for building an additional ocean outfall to supplement the Hyperion outfall that has given so much trouble. Low bid received Jan. 9 on the new outfall exceeded the engineers' estimate of $2,000,000 by more than $1,500,000, and awarding of the contract was taken under advisement.

PORTLAND, ORE.—Funds are available ($12,000,000 from bond issue approved May, 1944), plans have been drawn and construction could start soon on a project that would take all sewage from Portland, Ore., to the Columbia River. At present, the city sewers discharge into the Williamette River, whose low flow has been badly polluted. The plan proposed, which culminates more than 15 yr. of study, is to intercept all existing outfalls, pump the effluent through tunnels in the ridge on the peninsula between the two rivers and discharge into the Columbia, after passing through a primary treatment plant. The river outfall is designed for 155 mgd.

NEW YORK CITY—Aimed at reduction of pollution in waters adjacent to the metropolitan area, the present sewage treatment plan of the city calls for 17 plants, 15 of which will furnish secondary treatment. Of the 6 plants in operation at the beginning of 1945, 4 employ the activated sludge process, while a fifth uses chemical precipitation in summer and plain sedimentation in winter. The sixth, designed as a 60-mgd. activated sludge plant but never completed as such, provides only plain sedimentation. Present combined capacity of the six plants is 455 mgd. Plans for

the 63-mgd. Newtown Creek and 200-mgd. Owl's Head plants are nearing completion, while plans and specifications for the 18-mgd. Rockaway and 120-mgd. Hunts Point plants have been readied for bids. These 4 plants are to be of the activated sludge type. Construction on all 4 of these plants will probably get under way in 1946, with planning being rapidly advanced on additional units of the long-term program.

PHILADELPHIA, PA.—Faced with gross pollution of its own water supply and nuisance conditions creating public demand for corrective measures, Philadelphia plans sewage system improvements estimated to cost $42 million (loans already authorized). Already completed are more than two-thirds of the planned 107 mi. of intercepting sewers, which are estimated to cost $1,000,000. Work is under way on the northeast treatment works, now treating 60 mgd. in Imhoff tanks, to bring its capacity to 300 mgd. Sites have been acquired and plans are ready for bids on the southeast and southwest works, designed for secondary treatment of 150 mgd. and 250 mgd., respectively.

CHICAGO, ILL.—One of the largest sewer contracts for 1945, amounting to $10,386,125, was that awarded by the Sanitary District of Chicago for the construction of 23,700 lin. ft. of 18x20-ft. reinforced concrete intercepter sewer. This marked the initial step in the Sanitary District's $28,000,000 sewer program designed to eliminate a 40-yr. old nuisance of residential basement flooding on the city's south side. Plans for the remaining 47,100 lin. ft. of sewer, most of which will be 18 ft. wide by 20 ft. high, are well advanced, and additional contracts are expected to be awarded this year. If materials, equipment and manpower become available a second contract covering the construction of 16,550 lin. ft. of sewer will be let early this spring, and one for 15,800 lin. ft. some time this fall. Concurrent with this work contracts will be let for doubling the size and capacity of the Racine Avenue sewage pumping station, which will serve the new sewers. Plans are being actively prosecuted to increase the nominal capacity of the Southwest Sewage Treatment Plant, completed last year, from about 500 mgd. to 900 mgd. The Sanitary District of Chicago also plans to double the size of the present combination pump, boiler and blower house and sludge-drying building at the Southwest plant.

NEW YORK CITY—Little current construction is scheduled on the extensive program of the New York City Board of Water Supply. Bids were taken and rejected for completion of Merriman Dam, started in 1939 and stopped after a caisson cutoff wall and accessory structures were completed but before much of the 5,600,000 cu.yd. of rolled fill had been placed. Uncertainties as to labor costs over the extended period required for processing and drying of materials for the rolled fill was given by contractors as the reason for prices nearly $6,000,000 higher on a $14,000,000 bid then was called for under the 1939 contract. The work will be readvertised, with somewhat eased specifications, as soon as construction and labor conditions stabilize to the point where what the board considers a reasonable bid can be secured. If favorable bids are received, bids also will be asked on 6 mi. of tunnel and a dam similar to Merriman for the Neversink project and possibly also on 26 mi. of tunnel and a dam on the east branch of the Delaware River.

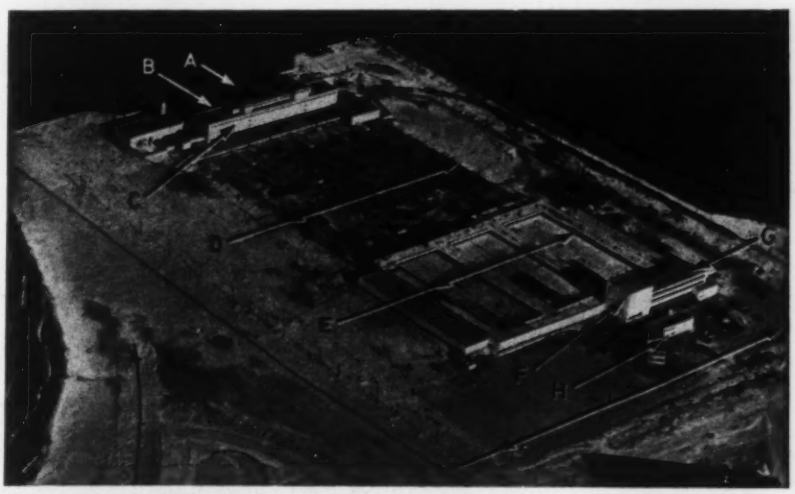
SAN DIEGO, CALIF.—Contracts for more than half the work had been awarded and construction was getting well under way about the first of the year on the 50-mgd., 71.6-mi. aqueduct project that will tap the Metropolitan Water District's aqueduct to supplement San Diego's water supply. The new aqueduct begins at the west portal of the San Jacinto tunnel and runs thence to San Vicente reservoir on the San Diego water system. Designs were prepared by the U. S. Bureau of Reclamation, the award of contract and general supervision of the work is in the hands of the U. S. Navy. Total cost of the project will be $15,000,000 to $17,000,000. Completion is expected early in 1947.

WASHINGTON, D. C.—Nearing completion, a welded, elevated, 2-mg. water tank will bolster distribution pressures in the Anacostia section. Spheroidal in shape, the 106-ft. dia. tank is supported on 16 4-ft. dia. outer columns and a novel fluted 40-ft. dia. central column.

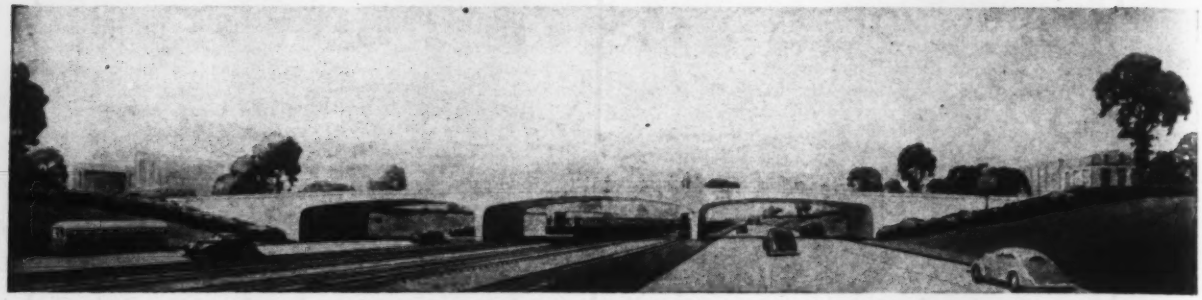
MUNICIPAL WATER SUPPLY

PHILADELPHIA, PA.—Construction has commenced on an $18,000,000 two-year water improvement program calling for rehabilitation and enlargement of the present Torresdale, Queen Lane, Roxboro and Belmont filter plants, as well as major rearrangements, replacement and extension of distribution conduits. Installation of new rapid sand filters to operate in series with existing slow sand filters which are used as polishing filters, will provide double filtration. Intended to alleviate present quality and pressure deficiencies, the work will provide adequate purification and distribution facilities to handle the 500-mgd. supply contemplated in the upper Delaware River source recommended late in 1945 by a board of consulting engineers. Detailed cost analyses of this new supply project, unofficially estimated to cost $100 million, are now in preparation. Construction of the recommended storage reservoir, regulating reservoir and deep rock conduits, expected to begin late in 1946, will require several years for completion. Ultimate goal of both plans is elimination of the present Schuylkill and lower Delaware River sources.

CHICAGO, ILL.—Only $1,625,000 worth of construction remains to be placed under contract for Chicago's $24,000,000 South District water filtration plant. In dollar volume of work done to date, it stands 80 percent completed. Current contracts, amounting to $4,529,000, will be completed soon and the entire plant is scheduled to be placed in full operation late this summer. Work now under way includes the installation of sand and gravel in the 80 filters; installation of boilers and accessories; wash-water, transfer and sludge pump piping; miscellaneous filter equipment; and superstructures of the administration and filter buildings. Work remaining to be put under contract includes supplemental architectural work and certain electrical equipment stripped out of the original specifications by order of the WPB, service roads and landscaping, the raw water tunnel connection to Dunne crib, and additional chemical feeders. The plant was placed in partial operation last September. Preliminary plans are now being made for a second filtration plant to be located on the near north side of Chicago, which is to have a nominal capacity 50 percent greater than the South District filtration plant.



Chicago's 320-mgd. South District water filtration facilities include: raw water intake, A; pumping station, B; chemical building, C; settling basins, D; filters, E; wash-water tank, F; laboratories, G; administration building, H; and clear water reservoir, I.



From Halsted St. west to the city limits, the Congress Street Expressway in Chicago will be fully depressed, with existing cross-street traffic being carried on attractively designed bridges. Provision is made for rapid-transit tracks between the four-lane pavements of the expressway.

TRANSPORTATION

PORTSMOUTH-PORTLAND TOLL ROAD —Draining and grading for the $15,000,000 Portsmouth-Portland toll road being built by the Maine Turnpike Authority will commence in 1946, but paving is not expected to be started until 1947. The 44-mi. long highway will have 4 lanes divided in the center by a median strip of 26-ft. average width. Of the total cost, $2,500,000 will be for structures. The project will be financed by sale of revenue bonds.

WILBUR CROSS PARKWAY—Projects between Meriden and Orange (south of Hartford) on this parkway running diagonally across Connecticut account for $3,250,000 of the approximately $11,000,000 program for the Connecticut highway system in the first postwar year. The majority of these jobs are now under contract. In the second year, just under $18,000,000 of work is scheduled, and projects on this same section of the Wilbur Cross Parkway are estimated for the second year at more than $2,500,000. Work on the Wilbur Cross Highway, east and northeast of Hartford, will amount to over $5,000,000 during the same two-year period.

NEW YORK STATE THRUWAYS—Construction of a system of "thruways" beginning on the outskirts of the New York metropolitan area and extending up the west side of the Hudson River valley to Albany and thence west through the central part of New York State to the Buffalo metropolitan region and on to the Pennsylvania state line will begin this spring at three or four widely separated points, if construction conditions are favorable. Designed to relieve traffic on existing highways in the populous sections of the state, this 486-mi. superhighway is expected to cost around $200,000,000. It will be built on a right-of-way not less than 200 ft. wide and will consist of either four or six 12-ft. traffic lanes separated by malls, the width of which will be varied in order to take advantage of the topography.

NEW YORK CITY EXPRESSWAYS—About $63,200,000 is scheduled to be spent in New York City for expressways and parkways in 1946. It is expected that $11,750,000 will be spent on Cross-Bronx Expressway, $11,650,000 on Van Wyck Expressway, $9,300,000 on Brooklyn-Queens Expressway, $2,050,000 on Bronx River Expressway, and $3,950,000 on Deegan Expressway. Of this $38,700,000 total, $14,050,000 will be spent for land. Also included in the 1946 program is the $7,000,000 Bronx River Parkway extension, the $10,590,000 Brooklyn-Battery Tunnel approaches and connections in Manhattan and Brooklyn, and the $3,867,000 Harlem River Drive.

BROOKLYN-BATTERY TUNNEL — Work was resumed in November on construction of the 9,000-ft. long, $80,000,000 vehicular tunnel connecting the Battery in downtown Manhattan with Brooklyn. Construction was started in 1941 and was to have been completed in 1944 but was halted late in 1942 as non-essential to the war. Work is continuing under the original tunnelling contracts, which require construction of parallel tubes of 31-ft. external diameter cast iron lining. The Brooklyn end is in soft ground and the two tubes have been advanced full size 1,250 and 830 ft., respectively, behind shields. From the Manhattan end, largely in good rock, a bottom drift has been advanced 3,350 ft. to be followed later by full sized excavation and lining. Work on the project is about 22 percent complete and it is expected that the two roadways in each of the tubes will be ready for service early in 1949.

WILLOW-NEWBURG FREEWAY, CLEVELAND—Plans for construction of a 6.6-mile freeway to provide a high-speed route into the center of Cleveland from the southeastern part of the city were approved by the city council on Dec. 10. Right-of-way for the 1¾-mile section at the outer end was secured some time ago, and work on a grading contract is 65 percent complete. Negotiations are in progress for right-of-way for the middle section. Plans are now being made for the third section, 3.3 miles long, ending in the Public Square in Cleveland. It passes through slum districts and over railway yards. Much clearing of land and a number of bridges are required for this section, which will cost $20,000,000.

DETROIT EXPRESS HIGHWAYS—Initial construction on the John C. Lodge Expressway in Detroit is expected to get under way by June of this year. Under the program approved for the first fiscal year, ending July 1, 1946, some $3,000,000 will be spent for acquisition of right-of-way and $650,000 for the construction of two railroad bridge grade separations. A similar amount has been set aside for right-of-way for the Detroit Crosstown Expressway and $900,000 for structures. Both expressways will be primarily of the depressed type of highway.

CONGRESS ST. EXPRESSWAY — Initial construction contracts are expected to be let early this year on the $50,000,000, eight-lane Congress St. Expressway in Chicago, which will be built jointly by the city, Cook County and Illinois State Highway Department. Foremost among the contracts scheduled for letting this year is one for the construction of 6.6 mi. of 7x7-ft. semi-elliptical concrete arch sewer to drain the depressed section of the expressway between Desplaines Ave. and the city limits. It is doubtful if actual construction will get under way this year on the State Highway Department's section of the expressway between Peoria St. and Sacramento Blvd. One of the chief obstacles to demolition of tenement buildings located on the new right-of-way is the extreme housing shortage in Chicago. Cook County plans to let no construction contracts on its portion of the Congress St. Expressway this year. The county has been making preliminary studies relative to the purchase of right-of-way since Nov. 1, 1945 when authorization was given to make plans. Negotiations are now under way between county and state for continuing the depressed section about 1½ mi. through the west suburbs of Chicago. This, added to the 6½ mi. depressed section proposed within the city will make it one of the longest sections of depressed eight-lane expressways in the country.

TEXAS EXPRESSWAYS—Three-year programs include expressway projects in Dallas and Ft. Worth of about 21 mi. at an estimated cost of about $13,000,000. The Dallas project, which is a north-south route known locally as Central Boulevard, is 12 mi. long and is estimated to cost $5,500,000. Plans and specifications are complete for this work, but have not yet been developed for $7,900,000 sections of a north-south and an east-west route in Ft. Worth, centered around the business area and totaling about 9 mi., because

of a local controversy regarding the route of the east-west expressway.

PENN-LINCOLN PARKWAY, PITTSBURGH—Bids have just been received on the first section of the Penn-Lincoln Parkway, which is designed to give greatly improved access to Pittsburgh from the east. Bids on two more sections will be called this month, and if acceptable bids are received, it is hoped to let additional contracts during the year covering the entire easterly end from a connection with the William Penn Highway to the Murray Ave. interchange within the city limits, 5.4 miles.

CHICAGO'S SECOND SUBWAY—Construction has been resumed on the Dearborn St. subway in Chicago, estimated to cost $30,000,000 exclusive of transportation equipment. Contracts were awarded last month for waterproofing tubes completed before the war and for the construction of an incline connection with existing elevated tracks at Evergreen Ave. In dollar volume of work completed, the subway was about two-thirds finished when the war stopped its construction. Some concreting of the tubes and tunnels, all heavy construction on 10 of the 11 subway stations, and 4 pedestrian subway galleries had been completed. Dearborn St. subway will be similar in design to State St. subway, which was completed in 1943. It will have a continuous center-platform station within the Loop under Dearborn St. and two separate tubes outside the Loop. Contracts for the tunnel construction and basic work for a subway station at La Salle and Congress St. are expected to be let next month. Operation of the subway is expected to be started in 1948.

KANAWHA AIRPORT — Some 10,000,000 cu-yd. of earth and rock is being moved to make an airport in the rugged topography of Kanawha county, only 3 miles from Charleston, W. Va. A maximum difference of 450 ft. exists from the top of the deepest cut to the toe of the highest fill. Grading on the $6,000,000 project is scheduled to be completed by early summer and paving by late in the fall.

WILKES-BARRE—SCRANTON AIRPORT—Nearly 50,000 cu.yd. a day of unclassified excavation, about 60 to 90 percent rock, is being moved on the Wilkes-Barre—Scranton Airport to level out three landing strips on a 350-acre site. Cuts range up to 38 ft. deep, fills to 45 ft., with some 4,000,000 cu.yd. of material to be moved. More than half of the earth-moving has been accomplished, with completion scheduled for some time in May, while paving is to be done through the coming summer to have the airport ready for operation by late fall.

IDLEWILD AIRPORT—New York City's municipal airport at Idlewild in Queens, 13 miles southeast of midtown Manhattan, is now practically ready for operation in its initial or three-runway stage with a temporary administration building. When completed, the 4,748-acre field will have 12 runways in a tangential pattern, similar to the vanes of a pinwheel, around a central loading hub. The cost of the improvement is estimated at $92,000,000 for the field and public use facilities, with an additional $89,000,000 now planned for airline hangars and private-use structures. An intermediate or six-runway stage of construction with a permanent central building and 3-mile long loading arcade building will be completed in 1949, and the airport is foreseen as finished in 1954 at a total cost of possibly $200,000,000.

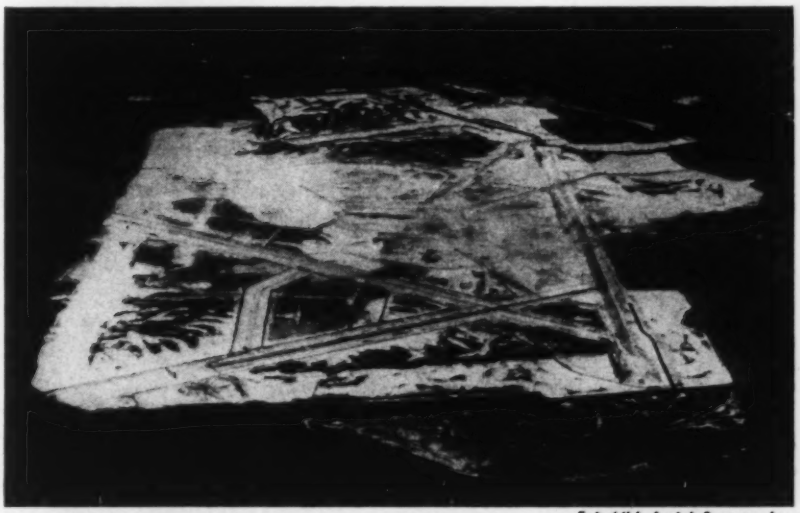
EAST BOSTON AIRPORT—The common wealth of Massachusetts is extending in stages the airport at East Boston, using some 50,000,000 cu.yd. of hydraulic fill to provide 500-ft. wide landing strips in a shallow area of the harbor. Four dredges are pumping 2,400,000 cu.yd. a month of fill, while a large quantity of dry material, to go over the hydraulic-placed muck, is being hauled from islands in the bay and from some distance on shore. The present 300-acre site will become the terminal and hangar area of the completed airport, which is expected to cost $30,000,000. A temporary terminal building is under construction; the permanent administration building is estimated to cost about $6,000,000 and will have space available for 30 loading and unloading stations. Present plans are to start construction of the administration building next summer as well as bituminous surfacing of three runways of the first-stage plan of the airport.

CHAIN OF ROCKS CANAL—Authorized by the Rivers and Harbors Bill of Mar. 2, 1945, construction is scheduled to start on the Chain of Rocks Projeet, above St. Louis, as soon as funds become available. This project calls for the construction of a 1,200-ft. navigation lock and an 8-mi. lateral canal with levees on each side to bypass dangerous rock ledges in the Chain of Rocks reach of the Mississippi River just north of St. Louis.

SAULT STE. MARIE, MICH.—Lake navigation through the Soo locks will be greatly expedited by two outstanding U. S. Army Engineer improvement projects which are scheduled for final completion early this year. One is the reconstruction and extension at a cost of $690,000 of the old Brady pier just below the MacArthur Lock. The new structure, containing a cellular type substructure with a concrete superstructure, involves the removal of the old timber-crib pier wall, 107,000 cu. yd. of excavation, and the placing of 217,000 sq. ft. of steel sheetpiling, 50,000 lin. ft. of timber piling and 10,000 cu. yd. of reinforced concrete. The second improvement is a 1,200-ft. extension, costing $560,000, of the Southwest Pier just above the MacArthur Lock. This work consists of installing a stone-filled timber-crib substructure surmounted by a concrete superstructure. It involves the placing of 300,000 cu. ft. of timber crib, 43,000 cu. yd. of crib and foundation stone, and 6,500 cu. yd. of reinforced concrete. Principal items of both contracts were completed by the end of last year.

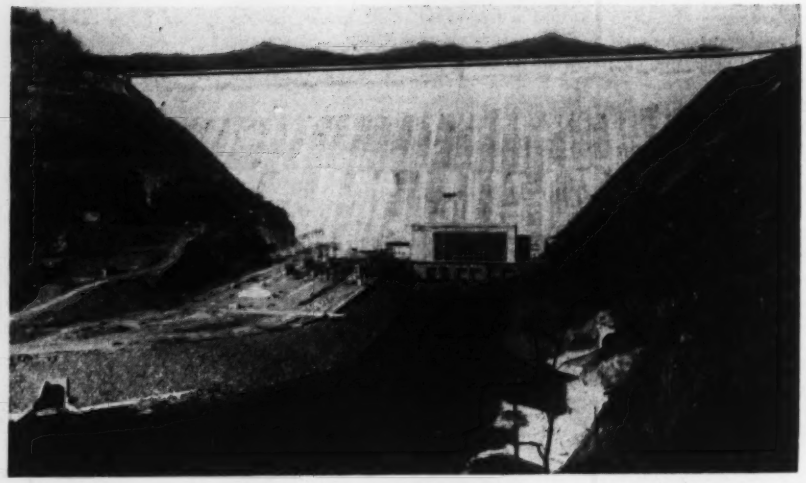
PANAMA THIRD LOCKS PROJECT—Although plans are complete and excavation nearly finished for the Third Locks Project for the Panama Canal as originally authorized, little construction may go ahead this year. Instead, the entire project will be resurveyed, as authorized by Congress late in 1945, to determine in view of the atomic bomb and other war developments which of three proposed programs is now best. These three plans are: Completion of the project as originally planned, continuation of the project after it has been modified to improve the canal as a facility for navigation and to increase its security against bombing, and reconversion of the Panama Canal into a sea-level waterway. However, the study is not limited to these plans. The new comprehensive survey of the project must be completed by Dec. 31, 1947.

SAN JACINTO CABLEWAY—The world's largest cable car system will probably be built this year to connect Palm Springs, Calif., and the snow-covered sportsland on Mt. San Jacinto 8,500 ft. above. To cost about $2,000,000, it will be 12,400 ft. long and will provide a vertical lift of 5,800 ft. at 1,000 ft. per min. It will be operated by the Mt. San Jacinto Winter Park Authority.



Fairchild Aerial Surveys, Inc.

New York City municipal airport at Idlewild, 13 mi. southeast of midtown Manhattan, takes shape with much of required hydraulic fill completed and three runways paved.



TVA's Fontana Dam and powerhouse were completed last year, except that a third generating unit may be installed in the future.

POWER AND IRRIGATION

ROSS DAM—Uppermost of Seattle's power developments on the Skagit River, this concrete arch dam is undergoing the second of the four successive construction stages that will ultimately bring it to the record height of 675 ft. The work now in progress was begun in 1943 but was delayed by a shortage of manpower.

TENNESSEE VALLEY AUTHORITY—Fontana and Kentucky dams, largest of the Tennessee Valley Authority's 16-dam construction program, were completed during 1945. Major construction is virtually at a standstill with no immediate postwar plans, though two relatively small dams, South Holston and Wautauga still remain to be finished.

CENTRAL VALLEY, CALIF.—A $1,163,340 contract was let in August for the first 5.6 miles of the 160-mile Friant-Kern Canal of the Central Valley irrigation and power project in California. Since $32,000,000 is available for contract committments before June 30, 1946, contracts may be awarded for another 65 miles of the canal before that time. During the year, contracts also may be let for 23 miles of the 110-mile Delta-Mendota Canal estimated to cost $56,000,000. Orders will be placed early in the year for pumps to be installed near Tracy, where water from the Sacramento River will be lifted 200 ft. into the canal. Work is to be resumed this spring on a 5.3 mile section of the Contra-Costa Canal, and work on the remaining 4.7 mile section, including Mountain View reservoir, may be under way shortly. At Friant Dam, drum gates are being installed and construction of the stilling basin soon will be started.

DAVIS DAM—Late in 1945 bids were opened for construction of Davis Dam and powerhouse on Colorado River, and on Jan. 10, 1946, a $21,462,505 contract was awarded. This replaces a contract cancelled because of war conditions. Located 64 miles below Boulder Dam, the 4,400,000-cu. yd. earth and rockfill structure will be 130 ft. high and will provide 1,940,000 acre-ft. of storage for servicing the Mexican treaty, producing power and regulating the river below Boulder Dam.

DESCHUTES PROJECT—Construction of the Deschutes Project to irrigate 50,000 acres of new land near Madras, Ore., will be prosecuted vigorously during 1946, in the hope that water can be stored this year in the Wickiup Dam reservoir. Work is also well advanced on the 65-mile main canal of the system.

LUGERT-ALTUS PROJECT—With nearly $3,500,000 available for construction contract awards between now and July 1, the Bureau of Reclamation expects to advance the Lugert-Altus Project well toward completion this year to serve 60,000 acres in southwestern Oklahoma. The dam is complete, except for the spillway gates, and will permit water to be stored for the next crop year. During 1946 the main canal, the west canal, and the Altus pipeline, which will deliver water to the city of Altus, and the Ozark canal will be started.

BOISE PROJECT—More than $5,300,000 is available to continue work on the 456-ft. high Anderson Ranch Dam of the Boise project in Idaho which will be the highest earthfill dam in the world when finished. The dam was more than 65 percent complete when the year ended, or sufficient to permit water to be stored for this year's irrigation season. Work is also being advanced appreciably on the Payette Division of the Boise project, for which about $3,500,000 is available, and construction of Cascade Dam on the North Fork of the Payette River in southwestern Idaho is expected to be started this year, including relocation of the highways and railroad facilities. This earthfill structure will provide water for irrigation of 25,000 acres and a suplemental supply for 85,000 additional acres. It is also hoped that the main canal can be completed during this year.

TUCUMCARI PROJECT—Water will be turned into the first unit of the Tucumcari project in New Mexico this spring by placing the first 40 miles of the Conchas Canal system in operation. The entire project is about 60 percent complete. This year's program includes completion of the 61-mile Conchas Canal and the first 21 miles of the Hudson Canal and the entire lateral system. Over $4,500,000 of contracts are expected to be awarded this year.

YAKIMA PROJECT—The 95-mi. main canal of the Yakima project in Washington is now substantially completed and all of the lands in the 47,000-acre gravity development are expected to be serviced this year. A $2,200,000 program for the Roza Division is planned this year, including construction of 10 of the 18 pumping stations and construction of much of the lateral system.

ALL-AMERICAN CANAL—During 1945 eleven more miles of the 144-mile Coachella branch of the All-American Canal in Southern California were virtually completed, which is in addition to the 86.5 miles completed in 1944. On Dec. 12, bids were opened for an additional eleven miles. The distribution system for the Coachella valley will be started this year, leaving the distribution systems for the East and West Mesas to be started in 1947 to complete the entire $70,000,000 All-American Canal project. Nearly $7,000,000 is available for construction this year.

HUNGRY HORSE PROJECT—To start construction of the $48,000,000 Hungry Horse Dam on the Flathead River in Montana, $1,700,000 is available. This structure, which will regulate flow above Grand Coulee on the main stem of the Columbia River, will provide storage for irrigation of about 100,000 acres. This year's program calls for completion of designs and specifications, relocation of the highways and railroads in the reservoir area, construction of a camp and much work on a highway and railroad to the dam site.

COLORADO-BIG THOMPSON—Lining of the 13-mile tunnel of the Colorado-Big Thompson project under the Continental Divide to carry water from Grand Lake to the east slope of the Rockies north of Denver is now approaching completion. This year Granby Dam and pumping plant, which are expected to cost more than $9,000,000, are to be started. Estes Park Dam, the aqueduct and power system on the eastern slope, the irrigation supply canal, the foothill reservoirs, and the feeder canals will also be placed under construction. Shadow Mountain Dam will be completed, as will some remaining work on Green Mountain Dam. About $8,500,000 is available for this current fiscal year.

MIRAGE FLATS PROJECT—This Nebraska development, which is expected to cost over $3,000,000, was well advanced at the end of 1945. Box Butte Dam on the Niobrara River is almost complete, and the main canal is also about finished.

MANCOS PROJECT—Expected to cost over $3,000,000, this Colorado project, now about 35 percent complete, includes construction of Jackson Gulch Dam on the West Mancos River, a 130-ft. high earthfill structure, which will provide 10,000-acre-ft. of storage to irrigate 10,000 acres.

PROVO RIVER—With $2,860,000 at present available, the Salt Lake aqueduct in Provo Canyon may be completed, enlargement of Provo reservoir canal will be accelerated, including rehabilitation of canals on the east side of the Jordan River, and work will be resumed on the Duchesne tunnel, which was about one-third excavated when discontinued because of the war.

FLOOD CONTROL

WILLAMETTE RIVER FLOOD CONTROL—Plans have been completed for the $27,650,000 Detroit reservoir in Oregon as part of the flood-control program for the Willamette River valley. It is to be a concrete gravity dam 370-ft. high about 60 miles above the mouth of the North Santiam River. Congress has appropriated $2,000,000, which will be used to initiate relocation of the North Santiam highway and for construction facilities.

Before the war, work was nearly completed on relocation of highways and railroads to make way for the reservoir formed by $4,300,000 Dorema Dam on the Row River above Eugene, Ore. Work now is to be started on the dam, which is to be an earthfill 145 ft. high and 4,650 ft. long. An appropriation of $1,000,000 is available. The work is scheduled for completion in 1947.

FOLSOM DAM—Work was begun early in the year on Folsom Dam, a large flood-control project on the American River in California. Estimated cost of the work is $18,474,000.

BUFFALO BAYOU, TEXAS—Work is well advanced on this project for the protection of Houston, Texas, local communities and the Houston ship channel. Construction of three detention dams and several miles of diversion canals is proposed, at a cost of $13,000,000 to the local communities and $18,500,000 to the federal government. About $3,000,000 has been spent, including construction of Barker reservoir, and $1,500,000 more is available. Work now planned includes the start of work on Addicks reservoir, to be formed by a long, low earthfill.

MISSOURI RIVER BASIN—Appropriations totaling nearly $19,000,000 assure start of work in 1946 on the combined Army Engineer-Bureau of Reclamation plan, which ultimately contemplates 99 dams, five of which will be on the main stem.

Garrison Dam—Largest of the dams is Garrison on the Missouri in North Dakota, for which $2,000,000 was made available for design and preliminary construction. It will be a rolled earth fill of 75,000,000 cu. yd., 12,000 ft. long and 210 ft. high, for which contracts will be let this summer for preliminary work. Construction may be started also on another big dam farther downstream in South Dakota at Fort Randall.

Kansas City and Other Local Works—Bids have been advertised for the first series of flood walls and levees for the protection of the industrial areas of Kansas City. First operations will be along the south side of the Missouri River in Missouri. Successive projects will extend along both sides of the Kansas River, and around the municipal airport at North Kansas City. Funds are available for start of work on local flood control projects at Omaha, Council Bluffs and Sioux City, and at various points between Omaha and Sioux City. Ft. Peck Dam will be topped out to project grade and work will be resumed at Kanopolis Dam on the Smoky Hill River in Kansas an earthfill 125 ft. high, which is about two-thirds complete.

Reclamation Dams—Heading the Bureau of Reclamation list of projects in the Missouri Basin to be started this year is the big Kortes Dam on the North Platte in Wyoming. Other projects on the list include dams at Canyon Ferry and Marias, in Montana, Heart River in North Dakota; Angostura in South Dakota; Boysen, Owl Creek and Glendo in Wyoming; Frenchman-Cambridge in Nebraska, and Bostwick in both Nebraska and Kansas; and Kirwin in Kansas. Funds are available for the extension and continuation of several existing irrigation projects in the Missouri valley during this year.

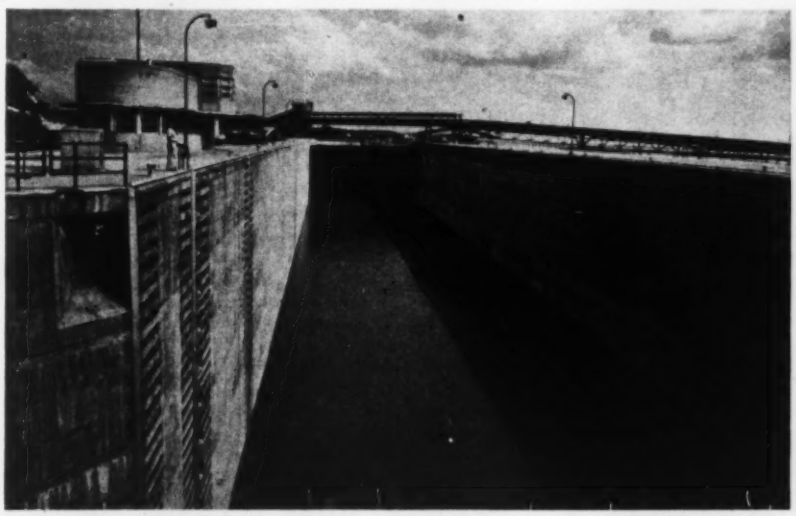
ST. LOUIS DISTRICT—Levee construction scheduled to be placed under contract by July 1 of this year in the St. Louis District involves the placing of 41,000,000 cu. yd. of earthwork in rebuilding some 117 mi. of levee to revised grade at an estimated cost of $13,700,000. Also included is the construction of drainage structures, flood walls, closure structures and access roads. Contracts for about 15,000,000 cu. yd. of this earthwork are now under way at Clear Creek, Preston Degonia, Fountain Bluff, Columbia and Prairie DuPont.

Contracts covering the reconstruction of an additional 148 miles of levee in the St. Louis District by the Army Engineers, at an estimated total cost of $14,000,000, are expected to be let between July 1, 1946 and Dec. 31, 1947. This will involve the placing of some 30,000,000 cu. yd. of earthwork, including appurtenant structures, as well as the construction and alteration of pumphouses. In addition, contracts will be awarded for 9,000 lin. ft. of piling dikes and 10,000 lin. ft. of bank protection, costing approximately $800,000.

LOWER MISSISSIPPI RIVER—Funds made available by Congress for flood control in the lower Mississippi valley are in excess of $41,290,000. Flood-control work on which construction will be started this year in the Vicksburg District, aside from the following four dams, include a $500,000 bank protection project at Shreveport, La., and a large project near the mouth of the Red River to provide partial protection for an extensive area from inundation by backwater from the Mississippi River.

Enid Dam—Part of the Yazoo Basin flood control project, to be located on the Yocona River about 12 miles south of Batesville, Miss., and estimated to cost about $10,000,000, this rolled-fill dam will be 8,500 ft. long and 86 ft. high. Bids may be called about Mar. 1.

Grenada Dam—Also part of the Yazoo Basin flood control project, to be located on the Yalobusha River just east of Grenada, Miss., this rolled-filled dam, 14,100 ft. long, 80 ft. high, will be under way by early sum-



Located on the east bank of Tennessee River, Kentucky lock is 110 ft. wide by 600 ft. long, with a maximum lift of 73 ft. TVA's Kentucky Dam was completed late last year.

mer. Total cost is estimated at about $17,000,000.

Narrows Dam—Contracts for this $6,000,000 multiple-purpose concrete dam, 941 ft. long and 188 ft. high, to be built on the Little Missouri River near Murfreesboro, Ark., will be awarded about Mar. 1. An initial installation of two power units of 8,500 kw. each is proposed, with provision for a third unit.

Bayou Bodcau Dam—Of rolled-fill construction, the dam will be 8,400 ft. long, 70 ft. high, with a 4,000-ft. long spillway and a dike 3,000 ft. long by 10 ft. high. Construction on this $2,000,000 project, near Bellevue, La., is expected to get under way by Mar. 1.

Memphis District—Local flood protection measures for Memphis, Tenn., will be resumed this year. A section of concrete flood wall is ready for contract immediately, and additional levee work will be placed under contract about Mar. 1. The sum of $1,000,000 is available for beginning the Fairfax and May pumping stations.

New Orleans District—Projects in the New Orleans district to be started soon include construction of the Bayou Sorrell Lock located 15 miles south of Plaquemine, La. This structure will provide closure for an existing navigation opening in the east guide levee of the East Atchafalaya Basin protection levee. Bids also are to be received soon for some 5,000,000 cu. yd. of channel excavation in connection with a flood control project south of Alexandria, La.

ARKANSAS RIVER—Work on Canton Dam on the North Canadian River near Canton, Okla., is to be resumed, bids on completion of the spillway and the 68-ft. high earthfill having been opened Feb. 7. Over $2,600,000 has been spent on this $13,870,000 structure, and $2,000,000 more is available. Congress also has provided $2,000,000 for further work on Fort Gibson Dam, estimated to cost $21,435,000, on which $2,428,000 had been spent before the war. It is to be a concrete dam 110 ft. high and 2,900 ft. long. A third uncompleted project for which more money is available is Blue Mountain Dam on the Petit Jean River near Danville, Ark., an earthfill 115 ft. high.

Three new reservoirs also are to be started. These are the Wister reservoir on the Poteau River about two miles above Wister, Okla., an earthfill 40 ft. high estimated to cost $6,500,000; Fall River Dam on the Fall River about four miles from Fall River, Kan., on a stream of that name, a 94-ft. high earthfill costing $9,500,000; and Hulah reservoir, a $6,500,000 project on Caney River about 15 miles above Bartlesville, Okla. This also is an earthfill, 60 ft. high.

WHITE RIVER—Construction of Clearwater Dam on the Black River near Piedmont, Mo., now 55 percent complete, will be resumed under an appropriation of $1,000,000. More than $4,000,000 has been spent, and the total cost of the earthfill structure is set as about $11,000,000. Construction of Bull Shoals Dam on the White River itself is to be started under a $3,000,000 appropriation. Ultimately, this 278 ft. high concrete dam will cost $47,000,000.

OHIO RIVER BASIN—Construction of Cen-

U. S. Bureau of Reclamation

Outlet works at Conchas Lake marks beginning of 75-mile long Conchas Canal, which, when completed, will provide for irrigation of 45,000 acres near Tucumcari, N. M.

ter Hill Dam on Caney Fork, 55 miles above Nashville, Tenn., which was 40 percent complete when stopped by the war, is to be resumed, $3,000,000 being available. Estimated to cost $25,400,000, this project consists of a 246-ft. high concrete dam and an earth fill.

Bluestone Dam—Work on Bluestone Dam, on the New River, upstream from Hinton, W. Va., is to be resumed with a $3,000,000 appropriation. About $10,000,000 was appropriated before the war for this 165 ft. high concrete dam that ultimately will cost $26,000,000. The dam will provide flood control benefits along the New and Kanawha Rivers, including the highly industrialized areas at Charleston, W. Va.

Wolf Creek Dam—Bids were opened Feb. 5 for completion of the $52,000,000 Wolf Creek Dam on the Cumberland River, a concrete dam 240 ft. high and a mile long. Only 8 percent of the work had been done when war shut the job down. To date, $11,600,000 has been appropriated for the work.

Conemaugh Dam—More flood protection for Pittsburgh is to be provided by construction of a dam on the Conemaugh River seven miles above Saltsburg, Pa., for which $3,000,000 has been appropriated. Estimated to cost $21,000,000, this is to be a concrete structure 137 ft. high and 1,290 ft. long at the crest.

Dillon Reservoir—An addition to the Muskingum valley system is to be provided through construction of Dillon reservoir on the Licking River six miles above Zanesville, Ohio. This is to be a rolled earthfill, 118 ft. high and 1,350 ft. long, estimated to cost $8,400,000. An appropriation of $1,000,000 is to be used to start construction.

Parkersburg, W, Va., is to be provided with protection against floods through construction of 10,000 ft. of floodwalls and 9,600 ft. of earth levees along both the Ohio and the Little Kanawha rivers, also six pumping stations. The total cost is set at $3,400,000, for which $500,000 has been appropriated.

ALLATOONA RESERVOIR—Plans for this 190-ft. high concrete gravity dam on the Etowah River in Georgia are complete and construction of an access road to the dam has been started. Congress recently allocated $3,000,000 for the dam and appurtenant works. The project, which is to cost $17,400,000, will be operated for flood control, navigation and development of hydroelectric power in the Coosa River Basin.

CLARK HILL DAM—Preliminary work on a concrete dam and powerhouse on the main stem of Savannah River 22 miles above Augusta, Ga., will be started this spring with $1,000,000 provided in the last deficiency bill. The project, which will provide flood control, navigation and power on the Savannah River, is expected to cost $35,000,000 and to require three to four years for completion.

BUGGS ISLAND RESERVOIR—Preliminary operations on this $30,900,000 flood-control and power project will be started next spring with $1,000,000 allocated in the last deficiency bill. A concrete gravity and earthfill dam about 150 ft. high will be built in Virginia on the Roanoke River 18 miles upstream from the Virginia-North Carolina state line.

DELAWARE RESERVOIR—With $1,000,000 appropriated by Congress, construction of Delaware Reservoir on the Olentangy River a few miles north of Delaware, Ohio, will be initiated. This $4,307,000 project will consist chiefly of a 92-ft. high earthfill dam with a concrete-gravity spillway section forming a reservoir of 132,000 acre-ft. capacity. A small dry-weather pool of about 75 acres will be maintained for low-water regulation and recreational purposes. Construction will require about three years.

SUSQUEHANNA RIVER—Work is being resumed on flood-control propects on the upper Susquehanna River. Construction of Almond Dam, a $3,000,000 earthfill on Canacadea Creek in Steuben County, N. Y. is to be started with an appropriation of $1,000,000. At Williamsport, Pa., levees and flood walls are to be completed on both banks of Lycoming Creek and the west branch of the Susquehanna at a total cost of $5,000,000. About $1,300,000 has been spent, and $1,000,000 more is available.

CONNECTICUT RIVER—Work on Union Village reservoir, a 170-ft. high earthfill on the Ompompanoosuc River in Vermont is to be started with an appropriation of $1,000,000. Estimated to cost $2,400,000, this dam is part of the Connecticut River flood control program.

LOS ANGELES AND LONG BEACH HARBORS, CALIF.—Completion of the authorized breakwater in these two harbors, designed to furnish additional anchorage space desired by the Navy Department, will be expedited in 1946. To date $23,906,000 has been expended and an additional $7,100,000 to complete the job has been appropriated.

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CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

DAVIS DAM AND POWER PLANT
ARIZONA — NEVADA

OWNER: Bureau of Reclamation, Davis Dam Project, Arizona-Nevada, Kingman, Arizona. S. O. Harper, Chief Engineer. H. Bahmeier, Construction Engineer.

PROJECT: Construction of Davis Dam, an earth and rock-fill dam across the Colorado River, approximately 30 miles west of Kingman, Arizona; and diversion channel through left abutment which forms forbay with concrete penstock, outlet and spillway structures across downstream and of forebay channel. Power plant to be located on left bank of river at downstream toe of penstock structure.

BIDS: Four bids were received December 21, 1945, ranging from the contract low of $21,462,505 to $27,481,947.50.

LIST OF BIDDERS:

1. Utah Construction Co., San Francisco, Calif. (contract) $21,462,505
2. Arizona-Nevada Constructors, a joint venture composed of: S. J. Groves & Sons, Minneapolis; Tanner Construction Co., Arizona; Lee Moor Contracting Co., Arizona; L. M. White; L. Lynch; Bowers and McLaughlin; S. A. Healy Co. $22,805,940
3. Davis Constructors, a joint venture composed of: Griffith Co.; Grafe-Callahan Constr. Co.; Peter Kiewit Sons' Co.; Shofner, Gordon, Hinman; Martin Wunderlich; Gunther & Shirley Co.; Hunkin-Conkey Co.; Brown & Root, Inc., Condon-Cunningham Co.; D. G. Gordon; J. C. McGuire & Co. $23,242,990
4. Dam Builders, Inc., a Nevada Corporation $27,481,947

This contract was previously let and awarded to Utah Construction Co., in May 15, 1942, *ENR* April 22, 1943, vol. page 641 for its low bid of $18,996,392.

In the comparison of the two low bids, one made in May 1942 and the present one in December 1945—an increase in labor costs during this period is reflected. The large-scale excavation jobs show no appreciable increase in unit prices. In 1942, 2,100,000 cu. yds. of common excavation was bid at $2.50 per yd.—while the same job was rebid in 1945 for 2,300,000 cu. yds. at $2.50.

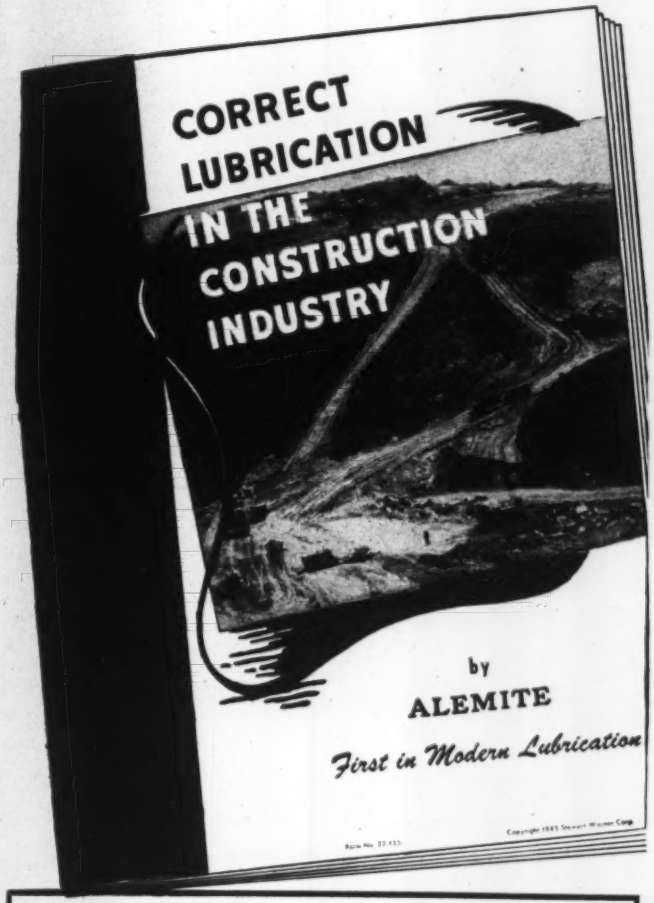
Those jobs requiring large amounts of labor (placing, finishing and installing) did increase. The placement of 14,000,000 lbs. of reinforcement bars bid at $.026 in 1942, was bid $.033 in 1945. Installation of 1,625,000 lbs. penstocks bid at $.035 in 1942 was bid at $.048 in 1945, and the installation of 2,500 lin. ft. of copper tubing for pizometers bid at $.40 per ft. in 1942 was bid at $.60 in 1945.

For labor cost comparison, the page rates prevailing at the site in 1942 and those prevailing at the present time are recorded below:

1942		1945	
Skilled Labor	$1.125 to $1.65	Skilled Labor	$1.375 to $1.75
Semi-skilled	0.875 to 1.25	Semi-skilled	1.25 to 1.375
Common Labor	0.825 to 0.90	Common Labor	1.00 to 1.25

Item No.	Item	Quantity	Unit Price	Unit Price	Unit Price
1.	Diversion and care of river during construction and unwatering foundations	Lump	800,000	960,000	1,355,000
2.	Excavation, stripping sand and coarse-aggregate deposit	200,000 cu. yd.	$0.25	$0.27	$0.50
3.	Excavation, stripping borrow pits	40,000 cu. yd.	.30	.27	.50
4.	Excavation, all classes, for diversion, spillway and outlet, and tailrace channels	1,000,000 cu. yd.	.71	1.00	.80
5.	Excavation, all classes, for forebay channel, roads, switchyard and parking area, and above elevation 520 for power-plant, intake, and spillway and outlet structures	2,300,000 cu. yd.	2.50	2.40	2.65
6.	Excavation, rock, below elevation 520 for power-plant, intake, and spillway and outlet structures	250,000 cu. yd.	4.70	5.00	3.00
7.	Drilling line holes for rock excavation	200,000 lin. ft.	.64	.40	.80
8.	Excavation, all classes, in tunnels and shafts	800 cu. yd.	30.00	35.00	30.00
9.	Excavation, common, for foundation of dam embankment above elevation 455	500,000 cu. yd.	.56	1.00	.50
10.	Excavation, common, for foundation of dam embankment below elevation 455	40,000 cu. yd.	2.00	1.65	1.50
11.	Excavation, rock, for foundation of dam embankment	18,000 cu. yd.	4.00	3.35	9.00
12.	Excavation, rock, for footings of concrete cut-off walls under dam embankment	600 cu. yd.	30.00	35.00	35.00
13.	Excavation, rock, for open cut-off trench under dam embankment on left abutment	1,000 cu. yd.	15.00	14.00	8.00
14.	Excavation, rock, for keys for switchyard footings	150 cu. yd.	30.00	35.00	40.00
15.	Backfill	5,000 cu. yd.	1.20	3.50	3.00
16.	Fills back of walls	30,000 cu. yd.	.75	1.25	1.00
17.	Rock fills back of gravity walls	30,000 cu. yd.	.65	.42	1.00
18.	Sand and gravel filter blanket under riprap	18,000 cu. yd.	1.00	1.65	1.00
19.	Riprap	87,000 cu. yd.	.90	1.65	1.00
20.	Rock surfacing	1,000 cu. yd.	.55	.65	2.50
21.	Road and parking-area surfacing	10,000 cu. yd.	3.00	4.00	3.00
22.	Excavation, common, in borrow pits and transportation to dam embankment	1,180,000 cu. yd.	.60	.65	.65
23.	Separating rock materials	2,000,000 cu. yd.	.33	.30	.40
24.	Loading and hauling stock-piled materials	3,000,000 cu. yd.	.44	.30	.30
25.	Earth fill in dam embankment	1,000,000 cu. yd.	.17	.25	.15
26.	Rock screenings in dam embankment	1,400,000 cu. yd.	.10	.15	.15
27.	Mechanical tamping of embankment materials	12,000 cu. yd.	2.50	5.00	3.50
28.	Rock fill in dam embankment	1,400,000 cu. yd.	.105	.15	.15
29.	Rubble-masonry walls	400 cu. yd.	30.00	50.00	40.00
30.	Rubble-concrete paving	750 cu. yd.	20.00	40.00	30.00
31.	Drilling holes for setting foundation drainage pipes	200 hole	10.50	15.00	7.00
32.	Drilling drainage holes not more than 25 feet deep in foundations	2,000 lin. ft.	5.35	7.00	6.00
33.	Drilling drainage holes more than 25 feet deep and not more than 50 feet deep in foundations	6,500 lin. ft.	5.35	7.00	6.00
34.	Constructing 6-inch diameter sewer-pipe drains with uncemented joints, embedded in gravel	3,000 lin. ft.	.87	1.25	2.00
35.	Constructing 8-inch diameter sewer-pipe drains with uncemented joints, embedded in gravel	7,000 lin. ft.	1.10	1.50	2.00
36.	Constructing 10-inch diameter sewer-pipe drains with uncemented joints, embedded in gravel	200 lin. ft.	1.25	1.90	3.00
37.	Constructing 12-inch diameter sewer-pipe drains with uncemented joints, embedded in gravel	3,100 lin. ft.	1.40	2.50	3.00
38.	Constructing 24-inch diameter sewer-pipe drains with uncemented joints, embedded in gravel	300 lin. ft.	3.60	4.00	6.00
39.	Laying 6-inch diameter sewer-pipe with cemented joints	650 lin. ft.	1.25	1.50	1.00
40.	Laying 8-inch diameter sewer-pipe with cemented joints	150 lin. ft.	1.50	2.10	1.00
41.	Laying 10-inch diameter sewer-pipe with cemented joints	200 lin. ft.	1.60	2.50	2.00
42.	Laying 12-inch diameter sewer-pipe with cemented joints	450 lin. ft.	1.70	3.60	2.00
43.	Laying 24-inch diameter sewer pipe with cemented joints	150 lin. ft.	2.60	5.00	5.00
44.	Constructing 24-inch diameter concrete pipe drains	300 lin. ft.	3.50	6.00	9.00
45.	Placing 6-inch diameter split tile drains	7,000 lin. ft.	1.00	.70	2.00
46.	Placing 8-inch square tile drains	9,500 lin. ft.	1.50	1.50	3.00
47.	Screened gravel under fills back of walls	350 cu. yd.	4.50	9.00	5.00
48.	Drilling weep holes	200 lin. ft.	2.40	9.00	3.00
49.	Core drilling 5¼-inch diameter holes not more than 30 feet deep	2,000 lin. ft.	15.00	12.60	10.00
50.	Drilling 1¼-inch diameter grout holes not more than 35 feet deep	30,000 lin. ft.	1.35	2.28	1.75
51.	Drilling 1¼-inch diameter grout holes more than 35 feet deep, but not more than 60 feet deep	80,000 lin. ft.	1.35	2.28	1.85
52.	Driling 1¼-inch diameter grout holes more than 60 feet deep but not more than 110 feet deep	42,000 lin. ft.	1.35	2.28	2.00

(Continued on page 176)



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CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

DAVIS DAM AND POWER PLANT ARIZONA — NEVADA

(*Continued from page* 174)

Item No.	Item	Quantity	Unit Price	Unit Price	Unit Price
53.	Drilling 1¾-inch diameter grout holes more than 110 feet deep but not more than 160 feet deep	20,000 lin. ft.	1.35	2.28	2.10
54.	Drilling 1¾-inch diameter grout holes more than 160 feet deep but not more than 210 feet deep	110,000 lin. ft.	1.35	2.28	2.25
55.	Drilling 1¾-inch diameter grout holes more than 210 feet deep but not more than 260 feet deep	3,000 lin. ft.	1.35	2.28	3.00
56.	Placing pipe and fittings for foundation grouting and drainage	100,000 pound	.24	.25	.20
57.	Pressure grouting foundations	300,000 cu. ft.	1.75	1.10	1.50
58.	Pressure grouting with packers	60,000 cu. ft.	2.20	1.90	2.50
59.	Placing metal tubing and fittings for grouting contraction joints	30,000 pound	.30	.25	.35
60.	Pressure grouting contraction joints and cooling systems	2,000 cu. ft.	.80	2.90	6.00
61.	Drilling holes for anchor bars and grouting bars in place	66,000 lin. ft.	1.40	.85	1.25
62.	Concrete in floor of forebay channel	1,600 cu. yd.	14.75	15.00	20.00
63.	Concrete in slope paving of forebay channel	30,000 cu. yd.	36.50	29.00	30.00
64.	Concrete in intake structure below elevation 647	165,000 cu. yd.	8.90	11.00	8.00
65.	Concrete in intake structure above elevation 647	6,500 cu. yd.	14.50	16.50	40.00
66.	Concrete in trashracks	5,000 cu. yd.	45.00	65.00	70.00
67.	Concrete in gate-erection pit	350 cu. yd.	32.75	65.00	40.00
68.	Concrete in tunnels and shafts	300 cu. yd.	50.00	65.00	50.00
69.	Concrete in left outlet abutment below elevation 647	16,000 cu. yd.	14.85	20.00	9.00
70.	Concrete in left outlet abutment above elevation 647	2,000 cu. yd.	20.50	16.00	25.00
71.	Concrete in piers and walls of spillway and outlet structure	50,000 cu. yd.	13.90	20.00	20.00
72.	Concrete in radial-gate sill and spillway crest	50,000 cu. yd.	9.15	12.00	10.00
73.	Concrete in floor of spillway and outlet structure	12,000 cu. yd.	12.70	11.00	15.00
74.	Concrete in lining of spillway and outlet channel	5,000 cu. yd.	17.75	20.00	20.00
75.	Concrete in bridges, walks, and operating floors of spillway and outlet structure	1,200 cu. yd.	57.00	35.00	80.00
76.	Concrete in superstructure of spillway	2,000 cu. yd.	50.00	50.00	80.00
77.	Concrete in blockouts	450 cu. yd.	34.00	35.00	50.00
78.	Concrete in substructure of power plant	26,000 cu. yd.	13.20	15.00	15.00
79.	Concrete in intermediate structure of power plant	18,000 cu. yd.	25.00	20.00	32.00
80.	Concrete in superstructure of power plant	3,500 cu. yd.	67.50	66.00	90.00
81.	Second-stage concrete in power-plant structure	22,400 cu. yd.	17.85	20.00	25.00
82.	Third-stage concrete in power-plant structure	2,100 cu. yd.	15.65	36.00	50.00
83.	Concrete in gravity walls	28,500 cu. yd.	17.90	20.00	13.00
84.	Concrete in footings of embankment cut-off walls	500 cu. yd.	16.25	30.00	20.00
85.	Concrete in embankment cut-off walls, except footings	400 cu. yd.	45.00	66.00	60.00
86.	Concrete in sidewalks, curbs, and gutters	800 cu. yd.	60.00	66.00	60.00
87.	Concrete in parapet walls along roadways	700 cu. yd.	55.50	85.00	80.00
88.	Concrete in switchyard structures	5,000 cu. yd.	63.00	85.00	50.00
89.	Placing reinforcement bars	15,500,000 pound	.033	.035	.043
90.	Placing metal tubing and fittings for concrete-cooling system	250,000 pound	.15	.20	.25
91.	Cooling concrete	240,000 cu. yd.	.60	.40	.50
92.	Chipping and roughening concrete surfaces	5,000 sq. yd.	5.20	1.65	2.50
93.	Finishing lighting recesses	165 recess	7.00	10.00	10.00
94.	Placing metal sealing strips	26,000 lin. ft.	.83	.40	1.00
95.	Placing metal cover plates over vent grooves and drainage grooves	5,500 lin. ft.	1.00	.80	1.00
96.	Placing joint filler	52,500 sq. ft.	3.7	.16	.30
97.	Constructing control joints	500 lin. ft.	1.40	1.65	2.50
98.	Constructing asphalt seals	2,250 lin. ft.	4.00	5.00	10.00
99.	Insulating reinforcement bars, electrical metal conduit, and cooling-system tubing	55,000 intersection	.17	.16	.20
100.	Placing insulation on roofs	12,000 sq. ft.	.54	.40	.25
101.	Furnishing materials and placing bituminous-saturated-felt roofing, complete with flashing	16,000 sq. ft.	.53	.35	.45
102.	Furnishing materials and placing membrane waterproofing	40,500 sq. ft.	.58	.35	.40
103.	Dampproofing outside walls	8,000 sq. yd.	.85	.80	.80
104.	Installing gate frames, guides, sills, hinge bases, and thrust blocks for fixed-wheel, bulkhead, and high-head radial gates	970,000 pound	.062	.08	.10
105.	Installing fixed-wheel gates and metalwork for gate counterweights and gate-erection pit	2,160,000 pound	.043	.05	.05
106.	Installing bulkhead gates	435,000 pound	.048	.05	.06
107.	Installing high-head radial gates	410,000 pound	.065	.05	.08
108.	Installing gate hoists for spillway fixed-wheel gates	520,000 pound	.033	.05	.05
109.	Installing gate hoists for penstock fixed-wheel gates	300,000 pound	.048	.05	.05
110.	Installing-gate hoists for high-head radial gates	90,000 pound	.058	.05	.05
111.	Installing trashracks	1,400,000 pound	.048	.04	.05
112.	Installing stop-log guides	448,000 pound	.061	.05	.07
113.	Installing penstocks	2,125,000 pound	.048	.045	.06
114.	Installing draft-tube pier noses	150,000 pound	.041	.05	.08
115.	Erecting structural-steel roof framing for power-plant machine shop	130,000 pound	.04	.05	.06
116.	Installing track rails	245,000 pound	.04	.05	.03
117.	Installing cranes	1,802,000 pound	.027	.015	.06
118.	Installing standard metal pipe, fittings, and valves less than 6 inches in diameter	216,000 pound	.19	.15	.13
119.	Installing standard metal pipe, fittings, and valves 6 inches or more in diameter	500,000 pound	.069	.12	.09
120.	Installing metal frames for openings in floors and walls	40,000 pound	1.78	.08	.13
121.	Installing metal inserts	10,000 pound	.30	.25	.22
122.	Installing oil-storage tanks	86,000 pound	.20	.035	.12
123.	Installing pumps	18,000 pound	.096	.17	.12
124.	Installing miscellaneous metalwork	215,000 pound	.27	.25	.25
125.	Constructing temporary gantry-crane-rail extensions	250 lin. ft.	5.00	10.00	15.00
126.	Constructing timber guard and support for conductors	2.0 M ft. b. m.	120.00	250.00	200.00
127.	Installing embedded electrical metal conduit 1½-inches or less in diameter	11,000 lin. ft.	.65	.25	.90
128.	Installing embedded electrical metal conduit more than 1½-inches and not larger than 3-inches in diameter	16,000 lin. ft.	1.00	.40	1.80
129.	Installing electrical nonmetallic conduit	17,500 lin. ft.	1.00	.40	1.20
130.	Installing ground wires and ground rods	14,000 pound	.25	.15	.20
131.	Installing electrical cable for resistance thermometers, strain meters, and joint meters embedded in concrete	8,000 lin. ft.	.38	.35	.40
132.	Installing copper tubing for hydraulic pressure piezometers	2,500 lin. ft.	.60	1.65	.50
133.	Transporting freight of all kinds for the Government or its agents, other than the contractor, between the railroad and the dam site	13,300 ton	4.00	6.00	5.00

PREPARATION OF CONCRETE AGGREGATES—CALIFORNIA

OWNER: Bureau of Reclamation—Central Valley project, California: R. K. Durant, construction engineer.

PROJECT: Excavation and preparation of 300,000 cu. yds. of sand and coarse aggregate for the Friant-Kern Canal at the Central Valley project, near Friant, California.

BIDS: Fourteen bids were received on November 20, 1945, ranging from the low of $207,500 to $457,500. The high bid being 120% greater than the low.

LIST OF BIDDERS:

1. George Pollock Co., Sacramento, Calif. — $207,500
2. Marshall S. Hanrahan, Redwood City, Calif. — 239,500
3. E. J. Warner, Stockton, Calif. — 249,500
4. W. J. Davis, Jr., Yuba City, Calif. — 251,000
5. A. Tiechert & Son, Inc., Sacramento, Calif. — 279,000
6. Rhodes Bros. & Shofner, Los Angeles, Calif. — 284,500
7. Claude C. Wood, Lodi, Calif. — 287,500
8. Triangle Rock & Gravel Co., San Bernardino, Calif. — 289,000

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation, stripping deposit	50,000 c. y.	$0.25	$0.05	$0.25
2. Preparing and stock-piling sand	110,000 c. y.	.65	.79	.79
3. Prep. and stock-piling coarse aggregate 3/16 to 3/8 in.	40,000 c. y.	.65	.79	.79
4. Prep. and stock-piling coarse aggregate 3/8 in. to 3/4 in.	70,000 c. y.	.65	.79	.79
5. Prep. and stock-piling coarse aggregate 3/4 in. to 1½ in.	80,000 c. y.	.65	.79	.79

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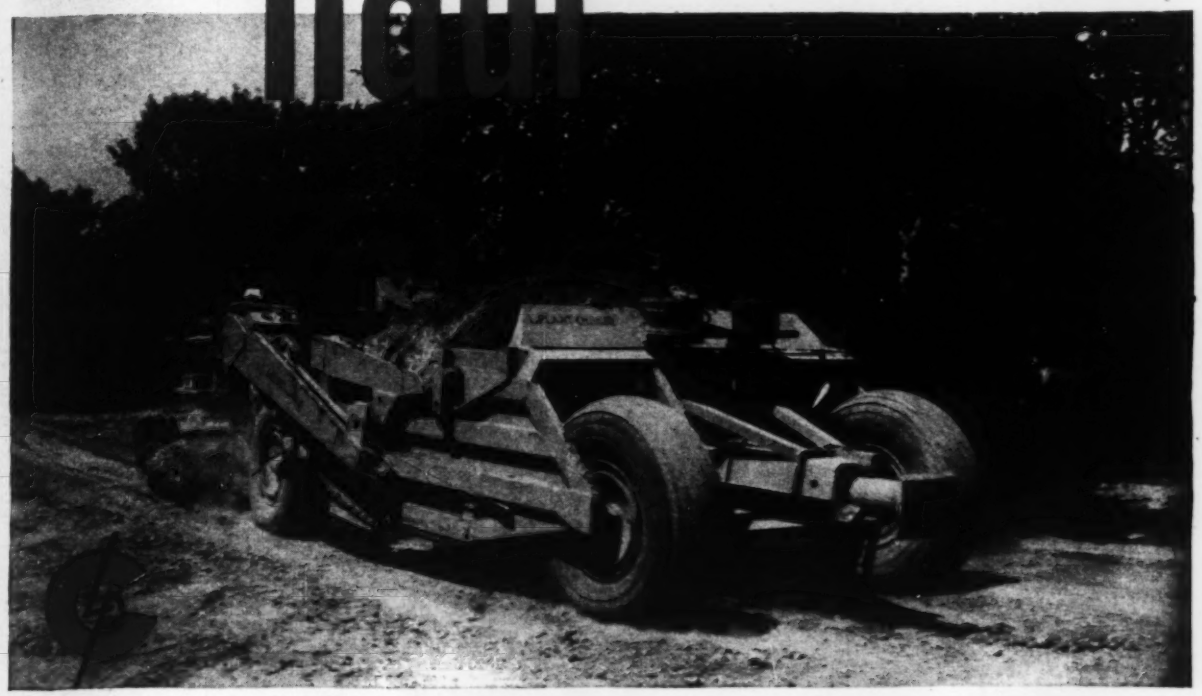

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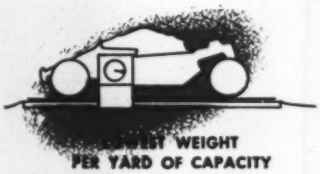

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MATERIALS AND LABOR PRICES

Market quotations on construction materials and wage rates reported monthly by ENR correspondents

CONSTRUCTION MATERIAL and labor rates in February as reported to *Engineering News-Record* reveal several changes from the preceding month. A $2.00 increase in cast iron pipe is reported for all ENR cities in February. This increase follows a $1.00 increase made for the previous month. Minneapolis is quoted as having a price range per net ton, 6 in. C.I. pipe of $60.10 to $61.83; and it should be noted that a "range" is likely in most cities as different prices for different jobs are constantly being made. OPA control of this material ended the first of the year. ENR reports hoisting engineers in Seattle this month to have a wage rate of $1.70 per hr.; hoisting engineers have previously been quoted in Seattle at $2.00. A check-up reveals a revision—not necessarily a wage drop—to the lower figure. In Atlanta, bricklayers went from $1.50 to $1.75; carpenters from $1.25 to $1.50; iron workers from $1.50 to $1.625 and hoisting engineers from $1.25 to $1.50. In Dallas, bricklayers went from $1.625 to $1.937; carpenters from $1.25 to $1.425; ironworkers from $1.50 to $1.625; hoisting engineers from $1.625 to $1.75; plasterers from $1.625 to $1.75 and common labor for building from 60c to 70c. In Denver, plasterers went from $1.65 to $1.90. In St. Louis, hoisting engineers went from $2.00 to $2.20. In New York City plasterers receive $2.00 in Manhattan and $2.25 in Brooklyn for a 7 hr. day. Boston reports increases in structural clay tile this month. In Detroit, 1½ in. and ¾ in. gravel jumped 25c per ton as did sand, now at $1.55 per ton.

CEMENT, AGGREGATE, READY-MIXED CONCRETE—F. O. B. CITY

	PORTLAND CEMENT (Per bbl., C/L lots, incl. 40c. per bbl. for bags, cash dis. not deducted)			SAND AND GRAVEL (Per ton, carload lots)			CRUSHED STONE (Per ton, carload lots)		CRUSHED SLAG (Per ton, carload lots, f.o.b. plant)		CONCRETE BLOCK (8x8x16-in.; truckload del.; per block)		READY MIXED (1:2:4, over 50 c.y., del.)
	Cloth *a*	Paper	Bulk	Gravel, 1½ in.	Gravel, ¾ in.	Sand	1½ in.	¾ in.	1½ in.	¾ in.	Sand-grav.	Lt.wgt. Agg.	
Atlanta	$2.77	$2.52	$2.43	$1.79	$1.89	$1. 68	$1.79	$1.89	$1.59	$1.69	$0.17	....	$8.30
Baltimore	2.62	2.37	2.12	1.80‡	1.80‡	1.30‡	1.80‡	1.80‡	1.75‡	1.75‡	.125	$0.125*w*	7.45
Birmingham	2.50	2.25	2.10	1.75	1.75	1.50	.85	1.00	.90	1.15	.1425	....	5.80
Boston	2.79*b*	2.72*b*	2.52	1.50‡	1.50‡	1.05‡	1.25‡	1.35‡	....	....	.13	.155*w*	7.55*m*
Chicago	2.90	2.65	2.50	2.15‡*d*	2.15‡*d*	2.15‡*d*	2.15‡*d*	2.15‡*d*	1.75‡	1.75‡	.18	.18*x*	....
Cincinnati	2.51	2.26	2.06	1.20	1.20	1.10	1.80	1.80	....	....	.12	.15*w*	6.70
Cleveland	2.59	2.34	2.19	1.75*i*	1.75*i*	1.25/1.65*i*	1.80*i*	1.80*i*	1.15	1.15	.14	.14	7.45
Dallas	2.51	2.26	2.06	1.50*p*	1.70*p*	1.10*p*	1.69*p*	1.79*p*	....	....	.15	....	7.15
Denver	3.32	2.72	2.47	1.20	1.25	1.90	1.65	1.75	1.00	1.00	....	.15	9.10
Detroit	2.59	2.34	2.19	1.75	1.75	1.55	2.25	2.25	2.00‡	2.00‡	.14	.15*w*	7.15
Kansas City	2.78	2.57	2.38	1.85	2.30	1.00	1.91	1.91	....	....	.125	.125*wy*	7.50*n*
Los Angeles	3.00*v*	2.40*v*	....	1.30	1.30	1.15	1.30*f*	1.30*f*	....	....	.04*bb*	.075*aa*	7.25
Minneapolis	3.07	2.85	....	1.00*k*	1.00*k*	.25*k*	1.00*k*	1.00*k*	....	....	.14	....	7.80*j*
Montreal	....	1.95*r*	1.79*r*	1.65‡*s*	1.65‡*s*	1.50*t*	.80*ct*	.90*ct*	....	....	.1999	$17*wt*	9.20*s*
New Orleans	2.41	2.16	1.92	1.67	1.65	1.22	....	....	.90	1.15	.19	....	9.25
New York	2.85‡	2.60‡	....	1.60*de*	1.60*de*	.90*de*	1.70*de*	1.80*de*	....	....	.16	.14*wcc*	8.25*k*
Philadelphia	2.73	2.48	2.28	1.55‡	1.65‡	1.20‡	1.90	1.95	1.10	1.10	.155	.155*w*	8.55
Pittsburgh	2.80	2.55	2.35	1.65‡	1.65‡	1.85‡	2.25‡	2.25‡	1.50	1.50	.17	.17*z*	8.40
St. Louis	3.00	2.72	....	1.75‡	1.75‡	1.65/1.75‡	1.25*h*	1.25*h*	.90*g*	1.15*g*	.155	.175*y*	8.60
San Francisco	2.21	2.01	1.71	1.36	1.36	1.36	1.46	1.46	....	....	....	.21*y*	7.55
Seattle	....	2.75*o*	....	2.35*d*‡	2.35*d*‡	2.35*d*‡	2.85‡*od*	2.85‡*od*	....	....	.16	....	7.25

‡ Delivered. *a* 10c. allowed for each returnable bag. *b* 10c. per bbl. off for cash. *c* F.o.b. quarry. *d* Per cu. yd. *e* Barge lots alongside docks. *f* Crushed granite. *g* F.o.b. Granite City, Ill. *h* F.o.b. plant. *i* Within three miles of Public Square. *j* 5% discount for cash. *k* Discount of 2 per-cent for cash in 10 days. *l* Up to 200 cu. yd. *m* 50c. off for cash. *n* 25 c.y. or more. *o* 2% off for cash. *p* 10c. per ton off, cash 15 days. *r* 10c. per bbl. off, cash 20 days. *s* 8% sales tax included. *t* 8% sales tax not included. *u* Withdrawn. *v* 20c. per bbl. discount; 80c. per bbl. for bags. *w* Cinder. *x* Waylite. *y* Haydite. *z* Celocrete. *aa* Pumice. *bb* 4 x 8 x 12 in. *cc* Also 8 x 18 x 18 in.

CASH DISCOUNTS CEMENT to Contractors: truck delivery, 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discount 10c. per bbl for payment within 15 days of date of invoice. Subject discount 10c. per bbl. 20 days in Montreal.

CURRENT MAXIMUM PRICE BASES AT CEMENT MILL

Charge for bags not included. For cloth bags, add 40c per bbl.; 10c. refund allowed for each returnable bag; for paper bags add 15c. per bbl., not refundable.

	Bagged	Bulk		Bagged	Bulk		Bagged	Bulk
Buffington, Ind	$1.90	$1.85	Ironton, Ohio	$1.80*	$1.75*	Richard City, Tenn	$1.80	$1.75
Dallas, Tex	....	....	Limedale, Ind	....	....	Steelton, Minn	2.00	1.95
Hannibal, Mo	1.90	1.85	Norfolk, Va	....	....	Universal, Pa	1 85	1.80
Hudson, N. Y	....	....	Northampton, Pa	1.75	1.70	Waco, Tex. (Plus 9c. tax in Tex.)	1.75	1.70
Independence, Kans	1.90	1.85	North Birmingham, Ala	....	....	Montreal City (Discount 10c. per bbl. 20 days)	1.68	1.67

* Destination price base; effective Sept. 17, 1945.

PAVING BRICK, BLOCK, ASPHALT, ROAD OILS—F. O. B. CITY

	PAVING BRICK AND BLOCK			PAVING ASPHALT (Per ton, less than 80 penetration)		ASPHALT BINDERS—FLUXES (Per gal., 80-300 penetration)		CUTBACK ASPHALT (Per ton)		ROAD OIL (Per gal.)	ASPHALT EMULSION (Quick-breaking) (Per gal.)	
	Granite per M lots of 50,000 4x4x8 in.	Brick per M 3x4x8½ in. carload lots	Wood per sq. yd. 3½ in. 16-lb. treat	Tank car	Drums	Tank car	Drums	Tank car	Drums	Tank car	Tank car	Drums
Atlanta	$73.00	$39.35	$2.25	$18.53*e*	.....†	$0.0740*e*	.....†	$0.0806*he*	.....†	$0.0781*e*	$0.0806	.....†
Baltimore	150.00‡	49.00	85.00*m*	15.00*r*	21.00*r*	.06*r*	0.9*r*	13.00*r*	23.00*r*	.06*r*	.07*r*	.14*r*
Birmingham	150.00	32.00*j*	.....	17.95	.....†	.0747	.....†	.0834*hk*	.....†	.065	.095	.....†
Boston	85.00	59.00	3.75	15.00	24.00	.0625	.115	17.00	30.00	.0625	.0825	.145
Chicago	150.00	55.00	2.50/2.80*d*	14.00	22.50	13.00*g*	21.50*g*	.0575*h*	.15*h*	.05*n*	.09/.10*n*	.13/.15*n*
Cincinnati	120.00	55.75	.....	17.00	.....	.085	.....	12.25	.....	0.7	.085	.....
Cleveland	120.00	34.00	3.74	17.00	19.00	.085	.095	.10*h*	.11	.08	.10	.....
Dallas	.....	36.00	.....	13.65	20.30	.06	.11	16.00	24.80	.06	.05/.07	.07/.09
Denver	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Detroit	.....	37.00	.....	17.60*f*	26.56*f*	.0734	.128	.0718*h*	.119*h*	.067	.0974	.135
Kansas City	.....	44.00	.....	18.50	23.50	.077	.1075	.077*h*	.107*h*	.057	.11	.15
Los Angeles	.....	50.00	.....	9.00*b*	23.00	9.50*bg*	24.00*bg*	9.50*b*	.....	.025	.072	.15
Minneapolis	.....	.....	2.017*d*	.....	27.70	.....	.126	.....	32.64	.....	.....	.....
Montreal	70.00	.....	.....	16.60*k*	24.25*k*	.1035*k*	.111*k*	.115*hk*	.135*hk*	.08*k*	.135*k*	.188*k*
New Orleans	.....	.....	.....	13.50*a*	20.00*a*	.057	.088	.06*h*	.095*h*	.....	.080	.....
New York	.....	65.00	.....	17.40	24.20*p*	14.00	.....	.0725*h*	.1325*h*	.....	.0700	.119
Philadelphia	150.00	62.00	4.06	15.00*r*	.....	14.00/15.00	.....	.0625*h*	.....	.....	14.00*qr*	.....
Pittsburgh	135.00	39.75	3.75	18.00	23.00	.09	.16	20.00	36.00	.07	.08	.13
St. Louis	.....	39.00	.....	14.80	19.80	13.80*g*	18.80*g*	.0587*h*	.1362*h*	.483	.07	.1215
San Francisco	.....	45.00	.....	10.90	21.15	10.90*g*	.....	12.90	.....	.....	.0525	.1125
Seattle	.....	.....	.....	10.90*i*	21.90*i*	.....	20.40*gi*	11.40*i*	13.90	10.90	.0525*i*	.0625*i*

‡ Delivered. *a* F.o.b. Baton Rouge. *b* Delivered to purchaser's warehouse. *c* 3½ x 4 x 8½ in. *d* 2-in. interior block, 6-lb. treatment. *e* Local reduction due to 20% reduction intra-state class freight rates, only Georgia affected. *f* Mexican. *g* Per ton. *h* Per gallon. *i* F.o.b. Martines. *j* 3 x 3½ x 8½ in. *k* Tax included. *l* F.o.b. Toledo. *m* Per thousand. † Available on priority only and quoted specially. *r* February 1943 prices, none later available.

Super Traction Tire Floats—Yet Grips; Has Greater Built-in Bruise Resistance

OFF-THE-ROAD tire users who worked in soft dirt, sand, loose loam, etc., often had serious traction and tire problems. Frequently the tires would mire, losing valuable time. And when the tires hit rocks and ruts (which can't always be avoided) they took walloping blows — shocking impacts under ton-loads that led to bruises and blow-outs.

But those tough tire problems were "meat" for B. F. Goodrich engineers. First, they designed a special tread with extra large contact area to provide flotation; it gave all the traction needed, but did not sink in and bog down. Then they designed a special *shock shield,* built it in under the tread.

The new tire was called the Super Traction (shown above). It gives maximum flotation. It permits a broad bite between the lugs, for heavy pulling and big yardage without slippage. It is self-cleaning, adding to its bite-in traction. And equally important, its *shock shield* gives extra protection against rocks and other damaging obstructions.

This shield, an exclusive B. F. Goodrich feature, is a set of four breakers — layers of rubber-coated rayon cords — between the tread and the plies. These breakers are in *pairs,* with the cords in each pair running parallel to each other — but with each pair running in opposite directions to give balanced strength. The breakers are cushioned with thick layers of shock-resistant rubber.

Under impact, the cords in the breakers stretch together, *not* across each other, and return to their original position. The blow is *distributed* and *absorbed* by the rubber cushions — the shock passed on to the cord body is greatly reduced.

Users of the Super Traction and other B. F. Goodrich tires built this way report longer wear. Repair bills are lower. Delays are reduced. *You* can make similar savings — with these B. F. Goodrich off-the-road tires. See the local B. F. Goodrich dealer or write us direct. *The B. F. Goodrich Company, Akron, Ohio.*

Truck Tires BY

B.F. Goodrich

IRON AND STEEL PRODUCTS—BASE MILL PRICES

	STRUCT. SHAPES-PLATE	REINF. BARS ¼-in. billet *b*	RIVETS ½-in. structural	WIRE NAILS Base *d*	SHEET PILING Base	STEEL RAILS Per Gross Ton Standard	Light	Re-rolled	TRACK SUPPLIES Angle Bars	Std Spikes *c*	Tie Plates *c*	Track Bolts
Birmingham	$2.10	$2.15	$3.75	$2.90	....	$43.00	$45.00	$45.00*	$2.70	$3.25	$2.30	$4.75
Chicago	2.10	2.15	3.75	2.90	$2.40	43.00	45.00	45.00*	2.70	3.25	2.30	4.75
Pittsburgh	2.10	2.15	3.75	2.90	2.40	43.00	45.00	45.00*	2.70	3.25	2.30	4.75
Buffalo	2.10	2.15	....	....	2.40	.....	.....	.....	....	....	2.30	....
Cleveland	2.10	2.15	3.75	2.90	....	.....	.....	.....	....	....	....	....
Youngstown	....	2.15	....	....	....	.....	.....	.....	....	3.25	....	....
Detroit	....	2.27‡	....	....	....	.....	.....	.....	....	....	....	....
Gulf ports	2.47*a*	2.52*a*	....	....	2.85*a*	.....	.....	.....	....	....	....	....
Pacific ports	2.75*a*	2.80*a*	....	3.40	2.95*a*	.....	.....	.....	....	....	....	....

‡ Delivered. *a* F.o.b.cars dock. *b* Rail steel same as billet prices. *c* Other basing points include Portsmouth, O., Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., and Pacific coast ports, on tie plates alone, Steelton, Pa., on spikes alone, Lebanon, Pa., Richmond, Va. *d* Add switching charge $18 per cl. * Per net ton.

IRON AND STEEL PRODUCTS—F. O. B. WAREHOUSE, PER 100 LBS., BASE PRICE

	STRUCTURAL SHAPES Per 100 lb. base price	REINFORCING BARS* Per 100 lb., ¼ in., base price 15 tons or over *b* New billet	Rail steel	Add Switch	$/cwt. for Del.	EXPANDED METAL LATH Per 100 sq. yd., carload lots Std. diamond mesh, 3.4 lb.	Std. ribbed 3.4 lb.	WELDED FABRIC REINFORCING Per 100 sq. ft., carload lots 4x16 in., No. 5 & 10 wires	4x12 in., No. 8 & 12 wires	6x6 in. No. 6 & 6 wires *k* Per 100 s. f.	SHEET PILING Per 100 lb. base price
Atlanta	$2.34	$2.40*	$2.40	$.02½	$.10	$21.05	$23.00	$1.82	$1.35	$1.91	$3.04
Baltimore	3.70	2.90	2.75	....	.10	23.00	25.00	1.70	1.27	1.79	3.00
Birmingham	2.10*a*	2.15	2.15	.02½	.10	19.00	21.00	1.80	1.34	1.89	....
Boston	3.912	3.994	....	$20 C.L.	.10	18.50	29.50	1.76	1.31	1.84	2.77
Chicago	2.10*a*	2.15*a*	2.15*a*	.03	.05	21.50	23.50	1.67	1.25	1.75	2.40
Cincinnati	3.68	2.53*ed*	2.53*ed*	....	.05	19.50	21.50	1.66	1.25	1.74	....
Cleveland	3.588*k*	3.10*k*	3.10*k*	.02½	.10	20.50	24.50	1.66	1.25	1.74	....
Dallas	4.25	3.17	3.17	....	....	25.50	27.50	1.93	1.42	2.03	....
Denver	....	....	....	....	....	.....	.....	....	....	....	....
Detroit	3.661‡	2.50‡	2.50‡	....	.10	30.00	30.00	1.68	1.26	1.76	2.66
Kansas City	4.19	2.61*cd*	2.61*cd*	.0	.05	25.50	27.50	1.78	1.33	1.87	2.874
Los Angeles	3.65*f*	2.575	2.425	.02½	.05	23.00	27.50	1.93	1.42	2.03	3.65
Minneapolis	3.87‡	2.70	2.70	.0	.10	21.00	23.00	1.80	1.34	1.89	2.79*d*
Montreal	3.95*i*	2.90*i*	2.80*i*	....	....	31.00*hi*	46.00*hi*	2.76	3.44*i*	2.82*im*	....
New Orleans	4.158‡*k*	3.59*k*	....	.05	.10	23.50	22.00	1.82	1.35	1.91	2.875
New York	3.75	2.76*c*	2.76*c*	....	.15	17.50	19.50	1.76	1.32	1.81	2.74
Philadelphia	3.666	3.668	....	....	....	20.50	22.50	1.71	1.28	1.79	2.72
Pittsburgh	2.10*a*	2.15*a*	2.15*a*	.02½	.10	23.00	26.50	1.59	1.20	1.67	2.40
St. Louis	3.697	2.74	2.74	.0	.05	28.00	34.00	1.69	1.27	1.78	2.70
San Francisco	4.35	2.825	2.675	.02½	.10	21.00	24.50	1.93	1.42	2.03	3.70
Seattle	2.75*e*	2.80*e*	....	....	....	34.50	38.50	1.93	1.42	2.03	2.95*e*

‡ Delivered. *a* Mill prices. *b* 5–15 tons, add 15c. 1–5 tons, add 25c. Less than 1 ton, add 50c. *c* 20 tons or over Base. *d* Mill price plus freight. *e* F.o.b. dock. *f* Includes delivery in free delivery zone. *g* Less than 1 ton, add 25c.; 1 to 5 tons, add 10c. * High scrap steel prices cut former 15c. differences between new billet and rail steel in many mills. *h* List price. *i* Plus Dominion and Province sales tax. *k* Quotation on changed basis; no actual price change. *m* Per sq. yd.

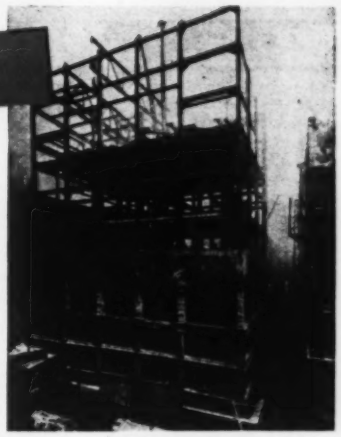
PLUMBING, HEATING, WATER, SEWER AND DRAIN PIPE

	C. I. PIPE Per net ton f.o.b. 6 in. to 24 in. *a*	VITRIFIED SEWER PIPE Per foot, std. 8 in., s.s.	Delivered std. 12 in., s.s.	ASTM 24 in.	C13–35 36 in.	CLAY DRAIN TILE Per 1,000 ft., carload lots, f.o.b. 6 in.	8 in.	CONCRETE SEWER PIPE Per ft., delivered; ASTM 12 in.	C 14–35 24 in.	WROUGHT STEEL PIPE Full standard weight, *h* 1 to 3 in., Butt Weld Black %	Galv. %	3½ to 6 in.; Lap Weld Black %	Galv. %
Atlanta	$53.66	$0.43*b*	$0.67	$3.39	$5.70*c*	$110.00	$140.00	$0.45	$2.00	48.2	54.2	59.7	51.2
Baltimore	57.00	.35	.60	2.70	7.25	160.00	200.00	.75	2.00	65.5	57.5	63.0	54.5
Birmingham	49.00	.275	.495	1.95	5.50	100.00	220.00	.50	1.70	62.2	54.2	59.7	51.2
Boston	59.40	.392*r*	.7156*r*	3.75*r*	7.9955*r*	170.00‡*r*	265.00‡*r*	.46*l*	1.77*l*	....	....	....	....
Chicago	58.33	.40	.675	2.70	7.00	110.00‡	150.00‡	.45	1.85	66.0	55.0	64.5	53.0
Cincinnati	57.27	.308	.4455	1.80	5.125	105.00‡*s*	170.00‡*s*	.36†	1.60†	57.1	43.4	54.0	39.6
Cleveland	58.75	.266*r*	.513	2.15	5.535	90.60	139.40	.36	1.60	68.5	57.5	66.0	54.5
Dallas	60.43	.31	.58	2.25	5.00	90.00	110.00	.46	1.57	....	....	....	....
Denver	65.56	....	....	....	....	....	....	....	....	....	....	....	....
Detroit	58.75	.385	.7425	2.925	7.75	170.00‡*u*	263.00‡*u*	.36	1.75	57.6	44.0	54.5	40.2
Kansas City	59.73	.31	.56	2.20	6.20	154.00	286.00	.45	1.60	35.6	46.1	46.2	59.4
Los Angeles	72.40	.325†	.585†	....	....	130.50	217.50	1.00	2.00	61.1	50.1	58.6	47.1
Minneapolis	[60.10-61.83]	.305†	.549†	2.196†	6.25†	....	....	.90	2.10	64.2	53.2	60.7	49.2
Montreal	69.00	.85*o*	1.50*o*	5.25*p*	8.50*ep*	45.00*m*	64.00*m*	.811*m*	2.31*m*	....	....	....	....
New Orleans	55.78	.37*r*	.78	1.69	....	150.00	220.00	.45	1.65	62.4	54.4	58.8	50.3
New York	56.40	.38	.75	3.06	7.88	....	....	.60	1.40	64.9	53.9	62.4	50.9
Philadelphia	55.00	.35	.675	2.835	7.35	165.00	225.00	.45	1.75	56.6	42.8	53.6	39.1
Pittsburgh	60.00	.287†	.553†	2.475†	6.45	124.00	193.80	.99	2.00*g*	68.5*i*	57.5*i*	66.0*i*	54.5*i*
St. Louis	56.84	.31	.558	2.232	4.95	93.50	242.00	1.00*j*	2.15*k*	68.5	57.5	66.0	54.5
San Francisco	72.40	.3625*d*	.6525*d*	2.61	6.52	115.00	192.50	.58	2.34	45.0	31.0	41.0	26.0
Seattle	74.20	.40	.72	2.88	....	115.20	....	.51*f*	1.44*f*	....	....	....	....

‡ Delivered. † F.o.b. *a* B. & S. class B and heavier, C/L lots, 200 tons and over Burlington, N. J. (base) $50.00. Based on existing freight rates; subject to rate change. Gas pipe and class A. $3 per ton additional, 4 in., $3 per ton additional, 30 in. and larger usually $2 per ton less. *b* Double strength. *c* List to dealer. *d* List. *e* 30-inch. *f* Less 5% for cash. *g* Culvert pipe. *h* Discounts from standard list consumers carload prices, except Pittsburgh prices are f.o.b. mill. Base price $200 per net ton. List prices per ft.; ¼ in., 8½c.; ⅜ in., 11½c.; 1 in., 17c.; 2 in., 37c.; 2½ in., 58½c.; 3 in., 76½c.; 4 in., $1.09; 6 in., $1.92; 3 per cent tax on transportation costs not included. *i* Applies also at Lorain, Ohio mills Chicago delivered base is 2½ points less on butt, 1½ on lap. Freight is figured from Pittsburgh. Lorain, O., Chicago Dist. Billing is from point producing lowest price at destination. WROUGHT IRON PIPE: Base price and list prices per ft. same as wrought steel pipe. Discount for Pittsburgh base. Butt-weld—1 in. and 1¼ in. black 34 galv. 16; 1½ in. black 38 galv. 18½; 2 in. black 37½, galv. 18. Lapweld—2½ in. to 3½ in. black 31½ galv. 14½; 4½ in. to 8 in. black, 32½ galv. 17. Reinforced; spec. C 76–37. *k* Reinforced; spec. C 75–37. *l* Plus sales tax. *m* Centri. spun. *n* 27-in. pipe. *o* Less 50%. *p* Less 53%. *s* Price quotations on delivered basis since Mar. 1940; current f.o.b. price $84 for 6 in.; $130 for 8 in. *t* Full truck load lots. *u* Scarce: carload quantities not readily available.

High time to get plans under way

Office Buildings

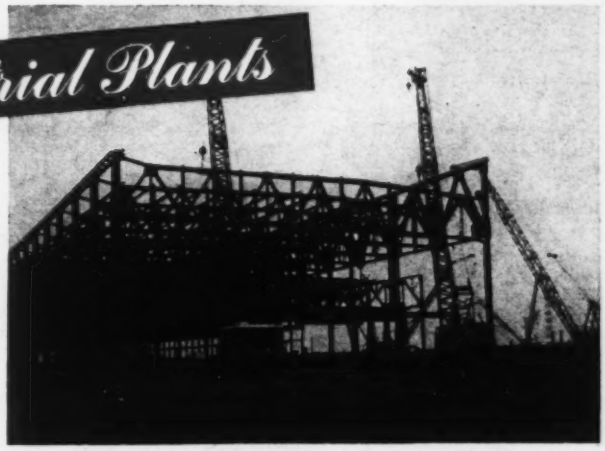


●New organizations, and old organizations streamlining buildings to meet modern business needs, require quick interpretation of their plans in terms of fabricated structural steel.

The three great Allied companies join forces to serve you super-fast in fabricating the steel, delivering tonnage to the spot, and erecting your buildings on schedule.

It is a matter of record that the Allied group can engineer a building from the blueprint stage to finished structure . . . and get the structural steel out on time.

Industrial Plants



●The industrial plant "builds proudly" today . . . steel structures . . . safe, distinctive, functional in design.

Allied's engineering skill, plus flexibility of the three Allied plants, assures fabrication of mass tonnage to specifications. Deliveries on schedule whether your order is for a ton, a thousand tons, or more.

Highway Bridges

●3500 Tons of Allied structural steel were used in the building of this great bridge which spans the Mississippi. This is an example of the way Allied co-operates to produce and erect the structural steel for bridges and other public projects where steel is used in the superstructure.

STRUCTURAL

STEEL COMPANIES

CLINTON BRIDGE WORKS, 101 S. Second St., Clinton, Iowa
GAGE STRUCTURAL STEEL CO., 3123-41 S. Hoyne Ave., Chicago 8, Ill.
MIDLAND STRUCTURAL STEEL CO., 1300-20 S. 54th Ave., Cicero 50, Ill.

ENGINEERS
FABRICATORS (75,000 TONS CAPACITY)
ERECTORS

LUMBER, TIMBER PLYWOOD—PER M FT., B.M., CARLOAD LOTS F.O.B.

	SHORT LEAF YELLOW PINE AND DOUGLAS FIR — All S. L. Y. P. is No. 2 common or better and for No. 1 N. C. Box. (Prices in Bold Face) — *All Fir planks No.2 common, Fir timber is No. 1 common. Lengths up to 20 ft. (Prices in italics)*									LONG LEAF Y. P. Merchantable grade up to 20 ft.		PLYWOOD Rail freight increment (See note for base price)	
	1x6 S1S	1x8 S1S	2x4 S1S	2x6 S1S	2x8 S1S	2x10 S1S	3x12 S4S	6x12 S4S	12x12 S4S	2x12 S4S	12x12 S4S	¼"	¾"
Atlanta	$41.00	$41.00	$35.50	$38.50	$37.50	$41.50	$45.00	.....	.....	$60.50	$64.00	$17.90	$21.85
Baltimore	44.00	46.00	44.00	46.00	47.00	52.00	65.00	.....	.....	115.00	120.00	18.25	22.25
	48.00	*49.00*	*55.00*	*55.00*	*55.00*	*57.50*	*68.00*	*$75.00*	*$75.00*	.....	.....	.....	.....
Birmingham	45.00	45.00	44.50	43.50	44.50	47.50	68.00	55.00	56.00	.....	.....	17.35	21.15
[1]	50.00	50.00	49.50	48.50	49.50	52.50	72.00	.....	.....	67.50	70.00	.....	.....
Boston	60.00[3]	60.00[3]	60.00[3]	60.00[3]	60.00[3]	62.00[3]	66.00[3]	.....	.....	58.00[3]	58.00	18.25	22.25
	55.00	*55.00*	*54.00*	*54.00*	*54.00*	*54.00*	*58.00*	*58.00*	*58.00*	.....	.....	.....	.....
Chicago	58.00	59.00	55.00	55.00	55.00	62.00	68.00	.....	.....	90.00*l*	90.00*l*	14.60	17.80
	53.00	*53.00*	*54.00*	*54.00*	*54.00*	*55.00*	*56.00*	*56.00*	*57.00*	.....	.....	.....	.....
Cincinnati	47.50	49.00	42.50	42.50	42.50	44.50	67.00	.....	.....	65.00	65.00	17.35	21.15
	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cleveland	42.50*k*	42.50*k*	52.50*k*	51.00*k*	65.00	65.00	83.00	83.00	83.00	.....	.....	17.75	21.60
Dallas *e*	45.25	45.25	44.50	43.00	43.00	47.25	60.75	58.75	58.75	88.75	85.00	14.60	17.80
Denver ‡	64.25[4]	64.25[4]	64.75[4]	65.25[4]	63.75[4]	64.75[4]	68.75[4]	*72.00*	*72.25*	.....	.....	10.45	12.70
Detroit	61.00	61.00	57.75	57.75	57.75	63.75	71.00	.....	.....	70.75	90.00	17.35	21.15
	57.00	*57.00*	*57.00*	*57.00*	*62.75*	*72.75*	*75.00*	*75.00*	*90.00*	.....	.....	.....	.....
Kansas City *a*	69.00	69.00	67.00	65.50	67.00	69.00	84.00	.....	.....	84.00	94.00	12.60	15.40
	66.00	*66.00*	*59.50*	*59.50*	*59.50*	*59.50*	*75.00*	*80.00*	*80.00*	.....	.....	.....	.....
Los Angeles *a*	*60.00*	*60.00*	*60.50*	*60.75*	*59.25*	*59.25*	*72.75*	*72.00*	*72.00*	.....	.....	9.90*gh*	12.05*gh*
Minneapolis ‡*b*	63.00[3]	62.00[3]	.....	.....	.....	.....	.....	.....	.....	.....	.....	12.60	15.40
‡	*63.00*	*63.00*	*60.00*	*61.00*	*59.00*	*60.00*	*61.00*	*65.00*	*65.00*	.....	.....	.....	.....
Montreal †[7]	*64.00*	*65.00*	*60.00*	*63.00*	*65.00*	*70.00*	.....	.....	.....	200.00	200.00	.....	.....
	90.00	*90.00*	*90.00*	*90.00*	*90.00*	*90.00*	*80.00*	*80.00*	*80.00*	.....	.....	.....	.....
New Orleans	42.00	42.00	39.00	38.50	34.00	42.00	46.00	.....	.....	54.50	69.00	14.60	17.80
	30.50	*30.50*	*30.00*	*30.00*	*29.00*	*29.00*	*28.50*	*29.50*	*29.50*	.....	.....	.....	.....
New York	[Range from $75.00 to $80.00]						[Range from $80 to $85]			120.00*f*	125.00*f*	18.35	22.25
‡	.....	.....	*65.00i*	*65.00i*	*65.00i*	*65.00i*	[Range from *$75* to *$95*]			.....	.....	.....	.....
Philadelphia	75.00	75.00	75.00	75.00	75.00	75.00	75.00	.....	.....	130.00	130.00	18.25	22.25
	75.00	*75.00*	*75.00*	*75.00*	*75.00*	*75.00*	*85.00*	*90.00*	*90.00*	.....	.....	.....	.....
Pittsburgh	50.80	53.20	52.75	55.00	60.85	62.50	76.25	.....	.....	120.00	130.00	18.10	22.05
	69.00	*68.10*	*66.10*	*65.30*	*65.20*	*65.75*	*82.75*	*88.75*	*88.75*	.....	.....	.....	.....
St. Louis ‡*c*	61.00	61.00	57.00	56.00	57.00	59.00	71.00	*75.00*	*75.00*	87.00	87.00	14.60	17.80
San Francisco *d*	*41.00*	*41.00*	*36.50*	*36.75*	*35.75*	*35.75*	*37.50*	*36.00*	*36.00*	.....	.....	7.30*g*	8.90*g*
Seattle	*45.50a*	*45.50a*	*45.75a*	*45.75a*	*44.50a*	*44.50a*	*47.75a*	*47.75a*	*46.50a*	.....	.....	0.00	0.00

Bold Face type, Southern Pine. *Italics, Douglas Fir.* [1] Long leaf. [2] Roofers N. C. Pine. [3] Spruce. [4] Native. [5] Western Pine, No. 3 Common. [7] Spruce. [8] Norway Pine. ‡ Delivered. *a* Yard prices. *b* Contractors discount in Minneapolis and St. Paul discontinued May 21, 1938. *c* 5M ft. or less. *d* F.o.b. cars San Francisco freight rate. *e* 10% discount taken off. *f* Up to 18 ft. † Plus sales tax.

Note: Special concrete form grade Fir Plywood, 4' by 8' panels, 5-ply, sanded 2 sides, water resistant glue, carload lots, delivered per 1,000 sq. ft. surface. Seattle base price on ¼", $95.15; on ¾", $104.85; price includes oiling and sealing charges. For other centers add rail freight increment from table or proper size. For resin dipped treatment, add $10.50 per M. *g* Lower rate by water shipment. *h* 50,000 lb. minimum. *i* Ranges from $65 to $75. *j* Average price. *k* August 1943 price. *l* September price; none later available.

GLASS, EXPLOSIVES, CHEMICALS

	WINDOW GLASS — Discounts from jobbers list, Aug. 15, 1938 — Single or Double Thickness		EXPLOSIVES — Per lb. 40% Ammonia Gelatin in 50-lb. cases delivered in 200 lb. lots*
	A quality	B quality	
Atlanta	74%	75%	$0.15
Baltimore	78%	79%	.15
Birmingham	76%	76%	.105
Boston	77%	78%	.15
Chicago	77%	77%	.15
Cincinnati	77-10%	77-10%	.15
Cleveland	77%	77%	.19
Dallas	76%	76%	.1575
Denver	76%	76%	.155*e*
Detroit	77%	77%	.1575
Kansas City	77-10%	77-10%	.155
Los Angeles	86%*d*	88%*d*	.1575
Minneapolis	77%	77%	.155
Montreal	40-10-2%*ab*	50-2%*ac*	.1675†
New Orleans	70%	75%	.16
New York	80%	81%	.22*f*
Philadelphia	78%	79%	.15
Pittsburgh	79%	79%	.1225
St. Louis	77-10%	77-10%	.155
San Francisco	66%	73%	.155
Seattle	75%	75%	.1575†

Price of 60% Ammonia Gelatin in $0.01 per lb higher than 40%

a Discount from list Sept. 1939; sales tax included, but 6% tax exemption not allowed for. *b* Single thickness. *c* Double thickness. *d* Discount from jobbers' list Sept. 15, 1928.

* Urban prices influenced by service charges or local storage and delivery regulations, do not consistently reflect quantity prices in less congested areas. *e* F.o.b. Louviers, Colo. *f* In boroughs of Kings, Queens and Richmond, and in Manhattan south of Canal St. add delivery charge of $6.00 per trip. † F.o.b.

40% Ammonia Gelatin price ranges in other than urban areas, per lb. (except Seismograph Grades)

	C/L 20,000 lb. net	Tons	200 lb. lots
E. of the Miss., except Fla. and Me	$0.105	$0.13	$0.15
W. of Miss. to Rocky Mtn. States, Fla. and Maine.	.11 -.1175	.135 -.1175	.155 -.1675
Rocky Mtn. States	.11 -.1225	.135 -.1525‡	.155 -.1725‡
Pacific N. W. States	.1075-.12	.1375-.15	.1575-.17
Pacific S. W. States	.1050-.1125	.135 -.1425	.155 -.1625

‡ F.o.b. Louviers, Colo., or Butte, Mont.

PILES, TIES F.O.B.

PILES

Prices per linear foot, fir and pine, bark on, f.o.b. cars, New York. Fir based on Wash. and Ore. points to New York shipping area; pine based on freight from Norfolk.

Dimensions	Points	Length	By Rail — Pine *	Fir
12-in. at butt	6-in.	30 to 50-ft.	$0.34	.....
12 in.— 2 ft. from butt	6-in.	50 to 59-ft.	.35	.....
12-in.— 2 ft. from butt	6-in.	60 to 69-ft.	.36	.....
12-in.— 2 ft. from butt	6-in.	90 to 100-ft.	...	.54
13-in.— 3-ft. from butt	5-in.	91 to 100-ft.	...	.56
14-in.— 2-ft. from butt	6-in.	50 to 69-ft.	.41	.63
14-in.— 2-ft. from butt	6-in.	70 to 79-ft.	.43	.57
14-in.— 2-ft. from butt	5-in.	80 to 85-ft.	.54	.....
14-in.— 2-ft. from butt	5-in.	85 to 89-ft.	.57	.....
14-in.— 2-ft. from butt	5-in.	90 to 100-ft.	...	.62

* Pine piling over 80-ft. available only in limited quantities.

RAILWAY TIES

Prices f.o.b. per tie for carload lots:		6"x8"x8' Untr.	6"x8"x8' Tr.	7"x9"x8'6" Untr.	7"x9"x8'6" Tr.
Boston	Oak	$1.50	....	$2.00	....
	Pine	2.00	$3.00*a*	2.50	$3.00*a*
New York	S. L. Sap Pine	1.43/1.54	2.59	1.76	2.86
	Mixed Oak	1.71	2.59	2.42	3.58
Birmingham	Hardwood	1.00	1.60*a*	....	2.25*a*
Chicago	Red Oak	....	2.45/2.65*a*	....	3.35/3.60
Los Angeles	Douglas Fir	2.00	3.25*a*	2.90	4.70*a*
Philadelphia	Red Oak	....	2.10*ag*	....	3.25*ag*
St. Louis	White Oak	1.60	....	2.40	....
	Red Oak	1.63	2.15*a*	2.19	3.25*a*
	Sap Pine or Cypress	1.70	....	2.06	....
San Francisco	Douglas Fir	1.25*bcf*	....	....	3.00*caf*
Montreal	Birch or Maple	....	1.65	1.04	....

Tr.— Treated; Untr.— Untreated. *a* Creosoted. *b* 6"x8"x8'6". *c* Empty cell. *d* Zinc. *e* Green. *f* F.o.b. cars. † Out of market. *g* January 1943 price, none later available.

CHEMICALS

Water, sewage treatment, road work, f.o.b. carlots, New York

Bleaching powder, in drums, f.o.b. works, per 100-lb	$2.50- 3.10
Chlorine cylinders, liquid, per lb., delivered	.0525
Calcium chloride, 77-80%, flaked, 100-lb. paper bag, del'd, ton.	18.50-35.00
Silicate of soda, 52 deg. in drums, f.o.b. works, per 100 lb	1.40
Soda ash, 58%, in paper bags, per 100 lb. dense	1.15
Sulphate of aluminum, commercial, in 100-lb. bags, per ton	23.00-25.00
Sulphate of copper, in bbl., per 100-lb	5.00

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME — DELIVERED

	STRUCTURAL CLAY TILE PARTITION — SCORED Per M lots of 2,000 pieces or over,			STRUCTURAL CLAY TILE — LOAD BEARING — SCORED Per M lots of 2,000 pieces or over			BRICK Per M in quantity		LIME		
	3x12x12 in.	4x12x12 in.	8x12x12 in.	8x12x12 in.	10x12x12 in.	12x12x12 in.	Common backing	Straight hard	Per ton, Hydrated finishing	In paper, Common hydrated	Carload lot, Pulverized, or lump
Atlanta	$110.00	$130.00	$230.00	$240.00	$270.00	$300.00	....	$24.00	$17.50	$13.50	$15.04
Baltimore	84.00	90.00	170.00	200.00	260.00	300.00	17.00*k*	21.00*k*	19.00	14.00	2.50*m*
Birmingham	80.00	85.00	160.00	191.00	252.00	288.00	16.50	23.00	18.11	13.64	2.25*lo*
Boston	105.00†*a*	112.00†*a*	210.10†*a*	252.09†*a*	.....	.....	20.00*i*	20.00*i*	21.00†	.....	16.00
Chicago	85.80	91.70	172.60	.....*x*	.....*x*	.....*x*	17.00	18.00	17.00	15.00	12.50
Cincinnati	65.55	69.90	131.20	148.70	210.35	240.45	27.75	27.75	15.50	13.00	.....
Cleveland	97.50	104.00	.....*x*	.....	.....	.....	22.75	22.75	15.75	13.25	.....
Dallas	71.40	76.40	145.30	183.50	238.00	294.50	15.25*i*	16.75*i*	19.00	15.00	15.00
Denver	99.00	112.00	185.00	214.00	248.00	294.00	21.50	21.50	.....	.....	.....
Detroit	92.70	96.70	174.50	198.80	257.20	294.30	23.25	23.25	19.00	16.00	16.00
Kansas City	67.00	69.00	89.00*c*	128.00	163.00	189.00	17.50	18.50	19.32	13.00	10.92
Los Angeles	73.50†*r*	89.50†*r*	128.00*c*†*r*	210.00†*r*	368.00†*r*	460.00†*r*	13.50	15.00	16.50	17.50	17.50
Minneapolis	.....	111.60*b*	186.25*b*	111.60	.....	.....	25.50	31.50*g*	24.00	16.00	19.00
Montreal	92.50*a*	98.50*a*	196.25*a*	151.50*a*	100.50*at*	134.50*av*	22.16†*u*	33.20†*u*	24.60*u*	15.00*u*	14.00*u*
New Orleans	72.00	72.00	135.00	162.00	210.00	260.00	14.00	.....	18.30	12.08	14.10
New York	99.40	106.00	145.75*c*	235.00*h*	287.40*h*	355.80*h*	19.50/20.50	.....	20.00	14.00	17.00
Philadelphia	112.10	119.60	224.20	269.10	321.20	405.10	20.75	23.75	19.00	16.00	15.00
Pittsburgh	88.40	94.30	176.85	212.30	260.85	298.10	23.25	25.25	17.90	15.40	2.55*m*
St Louis	67.00	72.00	130.00	190.00	244.00	290.00†	22.50	21.50	22.00	18.00	2.50*m*
San Francisco	96.00	108.00	144.00	108.00*t*	.....	.....	21.50	.....	24.00	23.00	2.50*m*
Seattle	115.00	125.00	230.00	125.00*tt*	.....	.....	20.50*k*	24.00*k*	20.00*s*	20.00*s*	3.00*m*

† F.o.b. *a* Smooth. *b* Carload lots delivered to job. *c* 6x12x12 in., 3-cell. *d* Not load bearing. *e* 48 lb. tile. *g* Selected common. *h* F.o.b. Perth Amboy, N. J. *i* F.o.b. Warehouse only. *k* $1.00 discount. *l* Lump. *m* Per bbl., 180 lb. *o* Per bbl., 200 lb. *p* 280 lb. bag. *r* 5% discount 10 days. *s* 2% discount for cash. *t* 5½x8x11½. *tt* 5x8x12. *u* 8% sales tax included. *v* 6x12x12-in. *w* Per 200 lb. bag. *x* Not available.

PAINT, ROOFING — F.O.B. CARLOAD LOTS

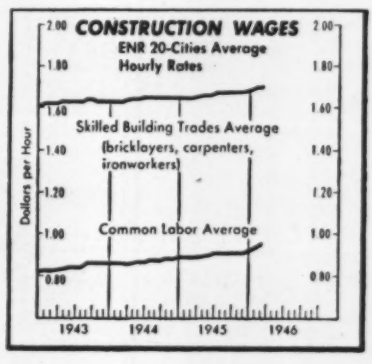
	RED LEAD Per 100 lb. in 600-lb. (Approx.) bbl. Dry *a*	WHITE LEAD Per 100 lb. in oil	READY-MIXED PAINT Per gal., drums Graphite *b*	Aluminum *b*	Ferric Oxide *d*	ROOFING SUPPLIES Carload lots f.o.b., factory Rolls, slate surfaced, 85–90 lb. per sq.	Asphalt felt, per 100 lb.	Tar felt, per 100 lb.	Asphalt coating per gal.	Tar pitch 350 lb. bbl. per ton
Atlanta	$10.25	$14.125	$1.30	$2.25	$1.20	$2.06	$2.06	$2.06	$1.00	$36.00
Baltimore	10.00	13.75	2.00	3.00	2.50	2.30	2.70	2.70	.40	29.00
Birmingham	10.25	14.125	2.35	3.50*r*	1.98*r*	2.09	1.98	1.98	.32	28.35
Boston	10.00	13.75	1.75	2.50	2.31	2.00‡*h*	3.30‡*uv*	3.30‡*uv*	.25‡	21.00‡
Chicago	10.00	13.75	....	....	....	1.75*hf*	1.74*hf*	1.82*hf*	.33*f*	23.00*f*
Cincinnati	10.00	13.75	1.70	2.90	1.60	2.20	2.10*h*	2.10*h*	.33	25.00
Cleveland	10.00	13.75	1.70	2.90	1.60	1.71	1.63*h*	1.61*h*	.237	25.00
Dallas	10.00	14.50	1.88	2.11*n*	.05*l*	1.75*h*	1.66*h*	1.66*h*	.35	39.00
Denver	10.00	14.25	....	....	....	....	....	....	....	.....
Detroit	10.00	13.75	1.75	3.00	1.60	2.25	2.25	2.25	.50	23.00
Kansas City	10.00	13.875	2.30*g*	2.55*gr*	2.16*g*	2.19	2.30	2.30	.28	27.50
Los Angeles	10.25	14.25	1.60	2.25	2.30	2.10	1.50	....	.45	.....
Minneapolis	10.00	13.875	....	....	....	1.7123*i*	1.6243*hi*	1.6243*hi*	.32	23.00
Montreal	.....	11.05	2.50*p*	4.90*p*	3.15*p*	2.71	2.45*t*	2.45*t*	.84*t*	1.83*kl*
New York	10.00	13.75	2.03	....*r*	1.82	1.7098	1.6273*a*	1.6273*o*	.26	23.00
Philadelphia	10.00	13.75	1.60/1.80	2.20*r*	1.55	2.25	2.71	2.71	.32	23.00
Pittsburgh	10.00	13.75	1.05	1.90	1.10	1.95	1.84*h*	1.84*h*	.34	26.00
St. Louis	10.00	13.75	2.28*s*	2.89*s*	1.96*s*	1.72	1.77	1.77	.35	23.00
San Francisco	10.25	14.00	1.80	2.75*n*	1.35	1.71	2.40	2.40	.33	20.50
Seattle	10.25	14.25	1.90	3.00	....	2.15	2.16*h*	....	.35	26.50*j*

‡ Delivered. Note: Red lead in oil 50c. higher than white lead in oil. *a* Red lead prices change frequently due to pig lead price changes. *b* U. S. War Dept. Spec. 3-49A. *c* ASTM Spec. D266-31. *d* 80% minimum ferric oxide. *e* Subject to 25% discount. *f* Distributors' price to contractors. *g* 55 gal. can. *h* Per roll, 65 lb. *i* Minneapolis and vicinity. *j* Asphalt pitch. *k* Per 100 lb. *l* Per lb. *m* Per bbl. *n* May, 1941 price. *o* 60-lb. roll. *p* Plus 8% sales tax. *r* Not available, except on priority rating; then quoted specially. *s* December, 1942 price. *t* Federal tax included. *u* 90-lb. roll. *v* Truck delivery.

SKILLED AND COMMON WAGE RATES — PER HOUR

	Brick-layers	Car-penters	Struct. Iron Workers	Hoisting Engineers	Plas-terers	Common Labor Building	Common Labor Heavy Const.
Atlanta	$1.75	$1.50	$1.625	$1.50	$1.50	$0.65	$0.65
Baltimore	1.75	1.675	1.90	1.625/1.80	1.725	.95	.95
Birmingham	1.75	1.375	1.625	1.50	1.65	.65	.65
Boston	1.725	1.60	1.725	1.50	1.667	1.15	1.15
Chicago	1.90	1.85	1.88	1.85	1.90	1.20	1.20
Cincinnati	1.825	1.60	1.725	1.45 /1.60	1.75	.90	.90
Cleveland	1.875*c*	1.65	1.875	1.875	1.875	1.085	1.125/1.155
Dallas	1.937	1.425	1.625	1.625	1.75	.70	.75 /1.25
Denver	1.80*b*	1.625	1.50*b*	1.625*b*	1.90	1.00	1.00
Detroit	1.725	1.50	1.825	1.675/1.825	1.775	1.00	1.00
Kansas City	1.75	1.575	1.70	1.70	1.75	.975	.90
Los Angeles	1.50	1.35	1.625	1.375	1.667	1.00	1.00
Minneapolis	1.625	1.50	1.625	1.60	1.725	.95	.95
New Orleans	1.625	1.375	1.625	1.55	1.50	.70	.80
New York	2.25*b*	2.10*b*	2.55	2.25*b*	2.00/2.25*b*	1.20	1.20
Philadelphia	2.00	1.58	1.90/2.00	2.25	2.00	.90	.90
Pittsburgh	2.00	1.75	1.75	1.8125	1.875	1.00	.90
St. Louis	1.90	1.70	1.90	2.20	1.90	1.00	1.00
San Francisco	1.875	1.50	1.75	1.50/1.75	1.75	1.00	1.00
Seattle	1.91	1.61	1.81	1.70†	1.91	1.21	1.21
Montreal*	1.06	.96	1.01	1.01	1.06	.61	.66

b 7 hr. day. *c* Prevailing rate on government work.
* Cost of living bonus now included in basic wage.
† Revised — See summary



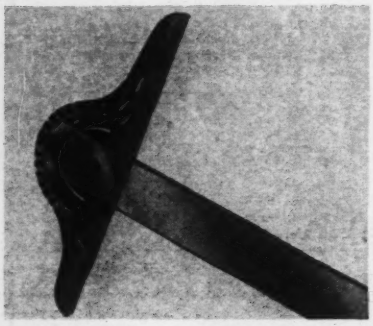
ENR Skilled Average: (Bricklayers, Carpenters, Ironworkers) $1.726.
ENR Common Average: $0.968.

New Aids to the Constructor

MANUFACTURERS' LATEST DEVELOPMENTS IN EQUIPMENT AND MATERIALS

Adjustable T-Square

Molded of heavy, colorful plastic, a new streamlined adjustable T-square features a protractor graduated in de-



grees. Another feature is that arms of various lengths—12, 18, 24 and 30 in.—are interchangeable.

The arm permits clear visibility over the entire surface of the work, and is so fastened to the head as to pivot to any angle. It is equipped with brass lugs for ink ruling.—*C-Thru Ruler Co., 385 Capitol Ave., Hartford, Conn.*

• • •

Safety Lifting Clamp

Two definite clamping principles are found in the new Volz Flat-Surface lifting clamp, it is claimed—one a pressure grip and the other a wedge grip. Any plate, container, assembly, etc., can be lifted provided it has a sufficient flat surface to engage the jaws of the clamp.

All working parts are used in a strong drop forging casing. One jaw is actuated on a cantilever basic principle; the specially constructed stationary jaw gives tremendous wedge power and grip. The clamp, in ½, 1, 3 and 6 ton capacities, will take from 0 to 2 in. in thickness.—*Merrill Brothers, 46-18 Arnold Ave., Maspeth, N. Y.*

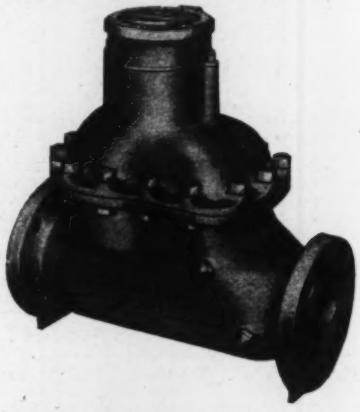
• • •

Compound Water Meter

Meter reading is speeded and errors eliminated, it is claimed, because the new Pittsburgh-Empire compound water meter has but a single register. This register records flows of both velocity and displacement measuring units through use of an over-riding clutch coordinator.

The meter's space-conserving interior design includes a horizontally positioned propeller with shaft mounted on hard rubber roller bearings, and a full-opening swing action valve with compensating linkage, providing a straight-through passageway for large volume flows. An Empire oscillating piston meter measures flow rates below the accurate capacity of the propeller unit.

The compound meter, smaller and lighter in weight than previous com-



pounds, is made in a complete range of sizes.—*Pittsburgh Equitable Meter Co., 400 N. Lexington Ave., Pittsburgh 8, Pa.*

• • •

Steel Tee-Post and Truss

New time-saving shoring developments, RJM trusses and tee-posts for concrete forms are said to be proved by field tests and actual use on large construction projects. Steel tubing having a tensile strength of 110,000 lb. psi. has been utilized.

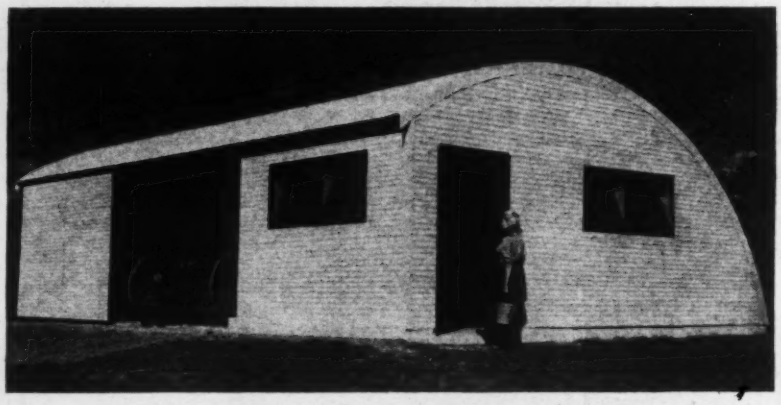
The truss is built sectionally, so that it may be quickly expanded or shortened as the architectural design requires. The tee-post has a screw adjustment at the bottom, similar to an automobile jack; it may be used in conjunction with the truss for floor and wall shoring, as well as beams and pilasters.—*Ray J. Moths Co., Inc., 714 West Wisconsin Ave., Milwaukee 3, Wis.*

• • •

Spot Welding Process

An improved technique of spot welding, the Dot-Weld process, is said to eliminate residual stress and contraction resulting from high temperature welding. This process, utilizing the new A-C Mogul Quench-Arc weld machine and the novel Dot-Weld pistol, penetrates from .001 up to ⅛ in. The air pressure unit built into the pistol quenches the electrode and the arc in a constant stream of cooling air.

The weld machine has a sturdy, streamlined cabinet, with a hinged top storage compartment, two 15-ft. lengths of cable, 20 ft. of air hose with fittings,



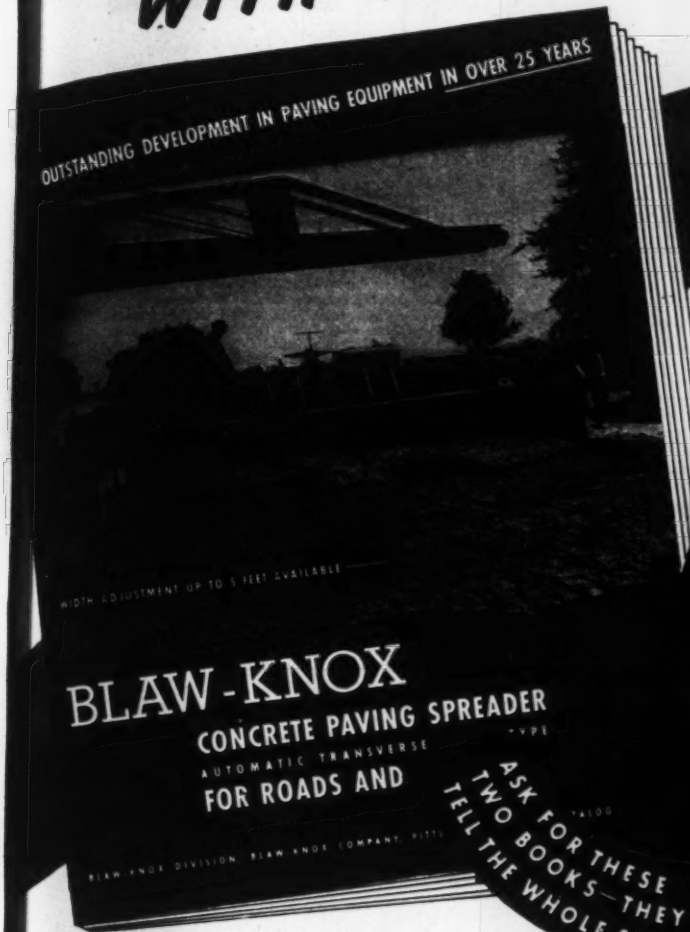
Quonset modified for garage and storage uses

Now in production is a modification of the round-roofed Quonset hut, differing from the older type in that it has a straight side. Designated the "Quonset 24," this building has an unobstructed interior suited particularly for garage and storage of implements, tools and vehicles, and also for rural utility purposes. Contractors may find it useful for field offices. While the basic unit is 24 ft. deep and 12 ft. long, as many sections as desired may be added to increase the length. Sliding doors and section panels are available.—*Great Lakes Steel Corp., Stran-Steel Div., Penobscot Bldg., Detroit 26, Mich.*

GET BLUE RIBBON PRODUCTION WITH THIS PAVING TEAM

CONCRETE SPREADERS

FINISHING MACHINES


OUTSTANDING DEVELOPMENT IN PAVING EQUIPMENT IN OVER 25 YEARS
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BLAW-KNOX
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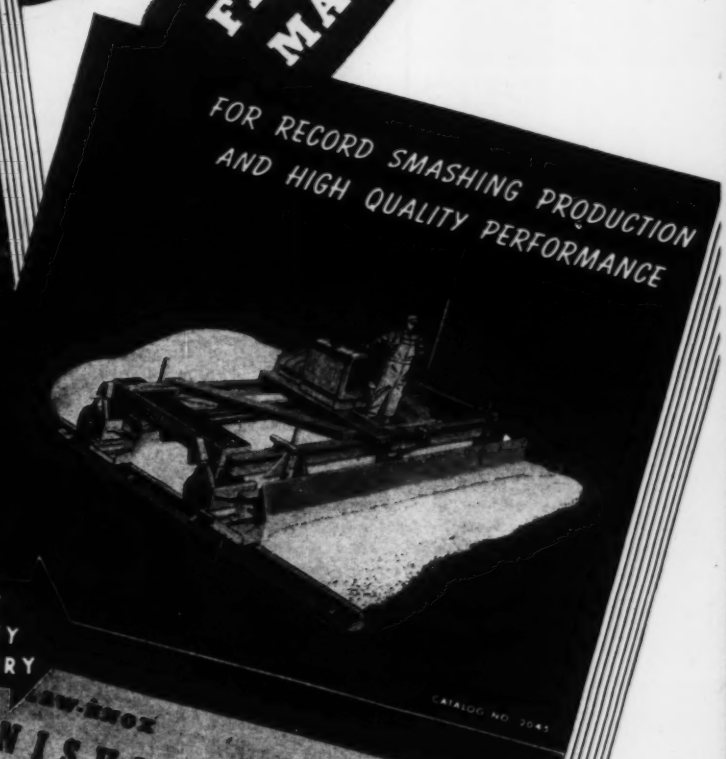
AUTOMATIC TRANSVERSE
FOR ROADS AND
BLAW-KNOX DIVISION, BLAW-KNOX COMPANY, PITTS



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BLAW-KNOX Transverse Blade CONCRETE SPREADERS
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BLAW-KNOX CONCRETE FINISHING MACHINES
(Send for Catalog No. 2045)

hese machines, and the complete line of Blaw-Knox Con-ruction Equipment, are the answers to faster construction and rofitable paving.

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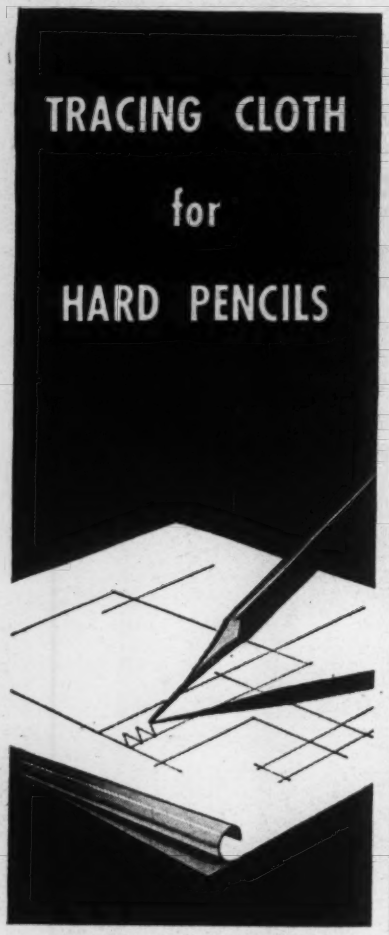
AW-KNOX DIVISION OF BLAW-KNOX CO., 2001 Farmers Bank Bldg., Pittsburgh, Pa. • New York • Chicago • Philadelphia • Birmingham • Washington



● Imperial Pencil Tracing Cloth has the same superbly uniform cloth foundation and transparency as the world famous Imperial Tracing Cloth. But it is distinguished by its special dull drawing surface, on which hard pencils can be used, giving clean, sharp, opaque, non-smudging lines.

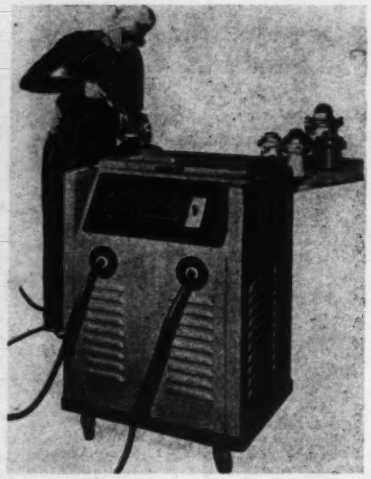
Erasures are made easily, without damage. It gives sharp, contrasting prints of the finest lines. It resists the effects of time and wear, and does not become brittle or opaque.

Imperial Pencil Tracing Cloth is right for ink drawings as well.

IMPERIAL PENCIL TRACING CLOTH

SOLD BY LEADING STATIONERY AND DRAWING MATERIAL DEALERS EVERYWHERE.

and other equipment. It is designed for 220 volt, 60 cycle, single phase, but

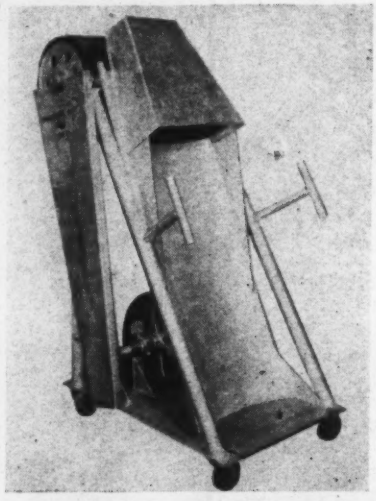


models are available for other voltages and cycles.—*Metallizing Co. of America, 1330 West Congress St., Chicago 7, Ill.*

• • •

Bag Dumper

Bags up to 350 lb. weight and 24 in. wide may be quickly lifted and emptied by the new Ritchie bag dumper; which operates on a ¼ hp. electric motor and can be wheeled about as needed. An automatic shut-off switch stops the motor at top and bottom positions of the lift, and as an added safety feature, a



special clutch arrangement disengages the motor if the downward return of the chute is obstructed. According to the manufacturer's announcement, the upward lift takes 10 seconds, with 8 seconds to lower.

The dumper has an adjustable height chute to fit narrow openings and prevent spilling; two spikes catch and hold the bag while dumping.—*ASCO Manufacturing Co., 601 South Anderson St., Los Angeles 23, Calif.*

Adams
DISTRIBUTORS
Headquarters for
MACHINERY and SERVICE

ALA.. Montgomery—Ray-Brooks Machinery Company
Birmingham—Tractor & Equipment Company
ALASK.. Fairbanks—Glenn Carrington & Company
ARIZ.. Phoenix—O. S. Stapley Company
ARK.. Little Rock—Little Rock Road Machinery Co.
CALIF.. Los Angeles—Lee & Thatre Equip. Co.
Sacramento—Sutton-Merf Tractor Co.
Redding—J. G. Bastain
San Jose and San Francisco—Valley Equipment Co.
Fresno—Brown Tractor Co.
Stockton—Thompson-Sage, Inc.
Salinas—Farmers Mercantile Co.
Santa Rosa—Stevenson Farm Equipment Co.
Modesto—Stanislaus Implement & Hardware Co.
Visalia—Exeter Mercantile Co.
Merced—Gallagher Tractor & Implement Co.
COLO.. Denver—McKelvy Machinery Company
CONN.. New Haven—W. I. Clark Company
DEL.. Phillips Machinery & Tractor Co., Baltimore
FLA.. Jacksonville, Miami, Tampa—Florida Equipment Co.
Pensacola—Ray-Brooks Truck & Tractor Company
GA.. Atlanta—Tri-State, Inc.
Albany—Tri-State Tractor Company
IDA.. Boise & Pocatello—Intermountain Equipment Co.
ILL.. Peoria & Springfield—A. E. Hudson Company
Salem—E. W. Werner Motor Company
Chicago—R. C. Larkin Co.
IND.. Indianapolis—Indiana Equipment Co., Inc.
IOWA.. Des Moines—Herman M. Brown Company
KANS.. Wichita—S. H. Denney Road Machinery Co.
KY.. Louisville—Brandeis Machinery & Supply Co.
LA.. Baton Rouge & Monroe—Dunham-Pugh Co.
MAINE.. Portland—Maine Truck-Tractor Co.
MD.. Baltimore—Phillips Machinery & Tractor Co.
MASS.. Newton Upper Falls—United Equip. Corp.
MICH.. Bark River—Bark River Culvert & Equipment Co.
Detroit and Grand Rapids—
Wolverine Tractor & Equipment Co.
MINN.. Minneapolis & Duluth—Rosholt Equipment Co.
MISS.. Jackson—Mississippi Road Supply Co.
MO.. St. Louis—Missouri-Illinois Tractor & Equip. Co.
Kansas City—Noel V. Wood, Inc.
MONT.. Billings & Missoula—Industrial Equipment Co.
NEB.. Omaha—Nebraska Tractor & Equipment Company
North Platte—Cornhusker Tractor & Equip. Co.
NEV.. Reno—Brown Motors
N. H.. Manchester—R. C. Hazelton Co.
N. J.. Trenton—Ross, Young, Dilts Company
N. M.. Albuquerque—Hardin & Coggins
N. Y.. Buffalo—Dow & Company, Inc.
Brooklyn—Edward Ehrbar, Inc.
Long Island—George Malvese & Co.
Albany, Syracuse—Milton-Hale Mach. Co.
N. C.. Raleigh—J. B. Hunt & Sons
N. D.. Fargo—Myhra Equipment Company
OHIO.. Cleveland—Gibson-Stewart Company
Cincinnati—Rish Equipment Co.
Cambridge—Major Equipment Co.
OKLA.. Tulsa & Guthrie—C. L. Boyd Company, Inc.
ORE.. Portland & Eugene—Howard-Cooper Corporation
PA.. Butler—National Equipment Co.
Pittsburgh—Atlas Equipment Corp.
Philadelphia—Service Supply Corp.
Harrisburg & Wilkes-Barre (Kingston)—
State Equipment Co.
R. I.. Providence—Tractors, Inc.
S. C.. Columbia—N. H. Summers Road Machinery Co.
S. D.. Sioux Falls, Rapid City—Empire Equipment Company
TENN.. Knoxville & Chattanooga—Brooks Equip. & Mfg. Co.
Nashville—Industrial Tractor & Equipment Co., Inc.
Memphis—Road Builders Equipment Co.
TEXAS.. Dallas & Houston—Browning-Ferris Machinery Co.
San Antonio—Jess McNeel Machinery Co.
Plainview & Sweetwater—Plains Mach. Co.
El Paso—Hardin and Coggins
UTAH.. Salt Lake City—The Lang Company
VA.. Richmond—Municipal Sales Company
Richmond and Roanoke—Rish Equipment Co.
Alexandria—Phillips Mach. & Tractor Co.
WASH.. Seattle—Howard-Cooper Corp.
Spokane—Intermountain Equip. Co
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WIS.. Eau Claire—Bark River Culvert & Equipment Co.

SEE Adams
AD ON OPPOSITE PAGE

Speaking of POSITIONS

ADAMS Gives You ALL These with Blade Centered on Circle

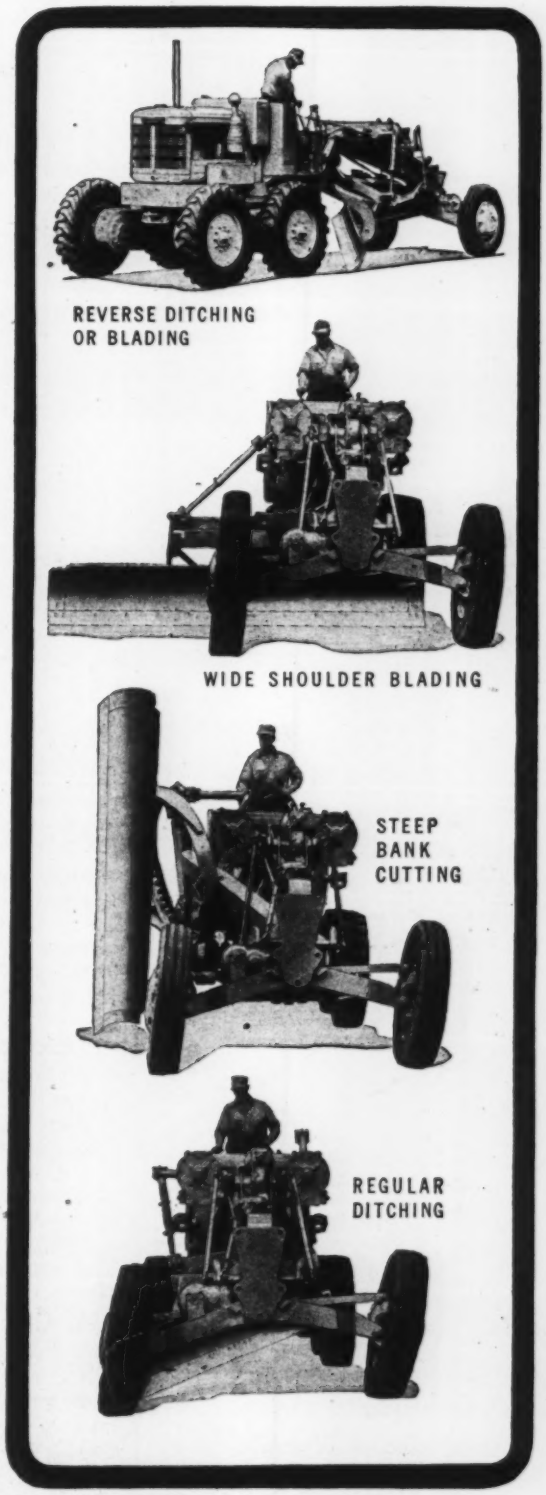
AN EXTREMELY wide range of blade positions—*obtained without mechanical adjustments*—is one of the important operating advantages which has made Adams Motor Graders top favorites the world over.

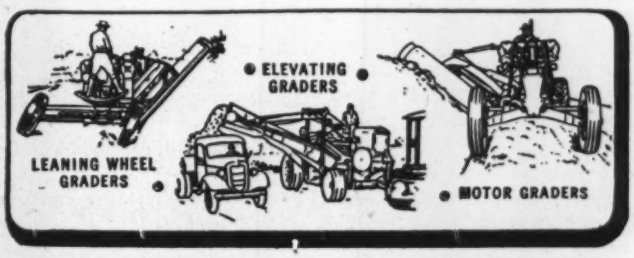
Quickly, easily, Adams fast power-operated blade controls—conveniently located at operator's finger tips—accurately position the blade for virtually all surface, ditch and bank work . . . *without shifting blade on circle or even adjusting blade lift links!*

Occasional cuts, which call for unusual blade positions, are easily handled through simple adjustment of telescopic lift links. Only where extreme blade positions are demanded is it ever necessary to shift blade on the circle.

Discover how this, and other Adams' superiorities, will speed operations, increase efficiency and reduce costs . . . for you! For complete information visit or phone your near-by Adams dealer.

J. D. ADAMS MANUFACTURING CO., Indianapolis, Indiana





Adams

ROAD-BUILDING AND EARTH-MOVING EQUIPMENT

Worthington-Ransome Blue Brute Distributors

See ad on page 189 for list of equipment in each line

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Ala., Birmingham, J. D. Pittman Tractor Company
Cal., San Francisco, Coast Equip. Co.
Colo., Denver, Power Equipment Company
Fla., Miami, Allied Equip., Inc.
Fla., Orlando, High Equip. & Supply Company
Tampa, Epperson & Company
Ga., Atlanta, Tractor & Machinery Company
Ida., Boise, Olson Manufacturing Company
Ill., Chicago, Chicago Construction Equipment Co.
Maine, Portland, Maine Truck-Tractor Company
Mass., Boston, Clark-Wilkes Co.
Mich., Muskegon, Lakeshore Machy. & Supply Co.
Minn., Minneapolis, Phillippi-Murphy Equip. Co.
Miss., Jackson, Jackson Road Equip. Co.
Mo., Clayton, The Howard Corporation
Montana, Billings, Interstate Truck & Equip. Co.
Helena, Caird Eng. Works
N. M., Albuquerque, Bud Fisher Co.
N. Y., Albany, Milton-Hale Machinery Company
New York, Hodge & Hammond, Inc.
N. D., Fargo, Smith Commercial Body Works, Inc.
Okla., Oklahoma City, Townsco Equip. Company
S. C., Columbia, Smith Equipment Company
Tenn., Knoxville, Dempster Bros., Inc.
Texas, Dallas, Shaw Equip. Co.
Vt., Barre, A. M. Flanders, Inc.
Wisc., Milwaukee, Drott Tractor & Equip. Co., Inc.

Ransome Distributors

Ariz., Phoenix, Lee Redman Company
Ark., Little Rock, Kern-Limerick, Inc.
Conn., New Haven, W. I. Clark
Waterbury, Contractors Supply Company
D. C., Washington, M. A. Doetsch Mach. Company
Ill., Chicago, Thomas Hoist Company
Ind., Fort Wayne, American Steel Supply Co.
Ky., Paducah, Henry A. Petter Supply Company
La., New Orleans, Ole K. Olson Company
Md., Baltimore, Stuart M. Christhill & Company
Mich., Detroit, T. G. Abrams
Mo., Kansas City, Brown-Strauss Corp.
Neb., Lincoln, Highway Equip. & Supply Co.
N. J., Newark, Johnson & Dealaman
N. C., Raleigh, Smith Equip. Company
O., Cleveland, H. B. Fuller Equip. Company
Pa., Philadelphia, Giles & Ransome
Wilkinsburg, Arrow Supply Company
Tex., El Paso, Mine and Smelter Supply Company
Houston, McCall Tractor & Equip. Company
San Antonio, San Antonio Mach. & Supply Co.
W. Va., Charleston, Clyde P. Beckner, Inc.

Worthington Distributors

Ark., Fort Smith., R. A. Young & Son
Little Rock, R. A. Young & Son
Ind., Indianapolis, Reid-Holcomb Company
Iowa, Des Moines, Electric Eng. & Const. Co.
Ky., Harlan, Hall Equipment Sales Company
Louisville, Williams Tractor Company
La., New Orleans, Wm. F. Surgi Equip. Company
Md., Baltimore, D. C. Elphinstone, Inc.
Mass., Cambridge, Field Mach. Company
Mich., Detroit, W. H. Anderson Co., Inc.
Flint, Gransden-Hall & Company
Mo., Kansas City, Mach. & Supplies Co.
N. J., Hillside, P. A. Drobach
No. Bergen, American Air Compressor Corp.
N. M., Roswell, Smith Machinery Company
N. Y., Buffalo, Dow & Co., Inc.
New York, Air Compressor Rental & Sales
Olean, Freeborn Equip. Company
N. C., Raleigh, Caroline Tractor & Equip. Co.
O., Cleveland, Gibson - Stewart Company
Marietta, Northwest Supply & Equip. Co.
Toledo, The Kilcorse Mach. Co.
Oregon, Portland, Andrews Equip. Service
Pa., Allentown, H. N. Crowder, Jr., Inc.
Easton, Sears & Bowers
Harrisburg, American Equip. Corp.
Oil City, Freeborn Equipment Company
Philadelphia, Metalweld, Inc.
Pittsburgh, Atlas Equip. Corp.
Wilkes-Barre, Ensminger & Company
El Paso, Equip. Supply Company
Houston, Dye Welding Supply Company
San Antonio, Patten Machinery Company
Va., Richmond, Highway Mach & Supply Co.
Wash., Seattle, Star Machinery Company
Spokane, Andrews Equipment Service
W. Va., Fairmont, Interstate Engineers & Constr., Incorporated
Wyoming, Cheyenne, Wilson Equip. & Supply Co.

Buy Blue Brutes

Worthington Pump and Machinery Corp.

Worthington-Ransome Construction Equipment Division

Holyoke, Massachusetts

MEN AND JOBS

To Stephen J. Michuda, engineer of bridges, Chicago, Ill., for the last five years, goes credit for one of the major contributions to the war effort in that area. By reconverting the low-level Southwestern Avenue bridge into a lift bridge with 49-ft. clearance—a job which many said could not be done—and by reconstructing one swing bridge and four bascules over the Chicago River he made possible the passage of many large war craft from Lake Michigan direct to the Gulf of Mexico via the Chicago, Illinois and Mississippi Rivers.

Maj. James G. Collins, former New York construction executive, after five years' active service in the Canadian Northwest, Alaska, India, Burma, China and United States, reverted to inactive status Jan. 15. He was chief combat liaison officer with the American-trained and equipped Chinese engineers during campaigns against the Japs.

Before going to the Orient, Major Collins served on the Alcan Highway, as executive of the Whitehorse Engineer District at Whitehorse, Yukon Territory, and area engineer at Fort St. John, British Columbia, which office directed the construction of the wellknown Peace River suspension bridge on the Alcan Highway.

Before entering the Army in 1940, Major Collins was active for many years in the construction industry in New York, having been connected with the George A. Fuller Co., Portland Cement Association, Richmond Screw Co., and other organizations at different times.

An Atlanta office has been opened by the Frederic R. Harris Engineering Corp. of New York, in the Candler Building, which will be staffed in large part by men returning from military service or former TVA engineers. The office will be under the direction of **Calvin V. Davis,** vice president, who now is in charge of the organization's work in the South with headquarters at Knoxville. In addition to Mr. Davis, the staff at Atlanta will include **Edward R. Sanner,** former head of the production and cost control unit of the TVA design department and industrial engineer for the commerce department; **James R. Frost,** a former major in the Supply Division of the Army Engineers who was a power investigating engineer for the TVA before the war; **James M. Tuttle,** recently released by the aerial photographic unit of the U. S. Marine Corps and previously with the highway design section of the TVA; and **Joseph A. Roy,** a veteran of World War I who joined the TVA staff after 14 years in the Missouri State Highway Department.

Appointment of **Lt. Col. George Kibler** as executive officer of the Cincinnati, Ohio, District, U.S. Engineers has been announced. Col. Kibler succeeds **Capt. W. J. Derksen,** who soon expects to leave the government service. Col. Paschal N. Strong and Col. Kibler were associated together in England prior to the invasion of Normandy, where Col. Kibler served as chief of operations under Col. Strong.

Alfred Brahdy, senior structural engineer of the N. Y. City Board of Transportation, has been designated as acting division engineer in charge of the designs division. Mr. Brahdy since 1907 has been engaged in planning and construction of subways, and has been a consulting engineer on rapid transit for Buenos Aires, Chicago and San Francisco.

Theo Lanctot, for 25 years city engineer of Hull, Que., has resigned, effective March 31.

James Cherrington, a graduate of the University of Alberta, has been named divisional engineer for the Canadian Pacific Railway at Penticton, B. C. He succeeds **W. G. Dyer,** who becomes engineer of track for the C.P.R. with headquarters in Montreal. Mr. Cherrington was resident engineer for the British Columbia department of public works at Nelson, B. C., from 1935 to 1941.

H. P. Taylor, as resident engineer, and **W. W. Prescott** and **Henry Shaw** are in charge of an engineering office opened at Enfield, N. C., by the North Carolina State Highway and Public Works Commission.

Edward L. Cousins, Toronto civil engineer, who recently returned to his post as general manager of the Toronto Harbor Commissioners from his wartime post as administrator of Canada's Atlantic Ports, resigned but will continue with the commission as consultant. He is succeeded by **F. R. Scandrett,** who has been acting general manager.

THIS "LIVE BOOM" PAVER LOWERS COSTS

Let's consider the unique advantages of the boom on a standard 34-E Ransome Blue Brute "Dual Drum" Paver to see why you can lay more yardage . . . more accurately . . . with less manpower . . . than with any other paver.

Because this boom is really a "live boom" just like your crawler crane, it can be power-elevated to allow 9 ft. clearance under the bucket. And the paver can be operated *continuously* with the boom in the elevated position.

Think what that means. Whenever you want, or as often as you want, you can concrete retaining walls, abutments, headwalls, etc. in one operation *at the same time you lay the slab.* You eliminate the extra expense of doing those operations separately.

Moreover, because this "live boom" *spreads as it swings* it covers wider area with each batch . . . cuts down on costly hand shoveling.

OTHER BLUE BRUTE PLUSSES

In addition, a Blue Brute "Dual Drum" Paver has the fastest-charging, self-cleaning skip . . . hydraulically-controlled bucket, eliminating split batches . . . metal-to-metal spiral cut-off for precise water measuring . . . mechanically-operated batchmeter for all-season accuracy. These and other features are described in detail in Bulletin 208. Write for it.

24R5-3

KNOW YOUR BLUE BRUTES

Your Blue Brute Distributor will gladly show you how Worthington-Ransome Blue Brute construction equipment will put your planning on a profitable basis and prove that *there's more worth in Worthington-Ransome.* Act now! His name is listed on page 188. The number beside his name indicates the Blue Brutes he handles.

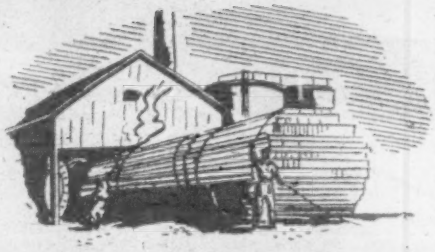
1.
Blue Brutes include: Pavers, Concrete Spreaders**, Concrete Mixers, Concrete Placing Equipment, Big Mixers, Finishing Machines**, Pneumatic Placing & Grouting Equipment, Truck Mixers, Plaster & Bituminous Mixers, and accessories.

2.
Blue Brutes also include: Diesel, gasoline and electric driven Portable Compressors from 60 to 500 cu. ft. capacity in mountings to suit all jobs; Rock Drills and Air Tools in a wide range of weights and sizes; Contractors' Pumps.**

**Postwar Products

BUY BLUE BRUTES

PRESSURE IS PROTECTIVE **TREATMENT**



For most effective wood preservation, the chemicals must be forced *deep* into the wood. American Lumber & Treating Company obtain this deep penetration by the vacuum-pressure method in closed steel cylinders. Dipping, brushing on, or other makeshift methods can't begin to give comparable results. So, when you buy treated lumber, remember to say, "*pressure*-treated" . . . it's best!

Whatever your needs —

AMERICAN LUMBER GIVES YOU ALL 3

1. Wolmanized Lumber* — protects against decay and termite attack.
2. Minalith—fire-retardant.
3. Creosoted lumber.

*Registered trademark

1649 McCORMICK BUILDING, CHICAGO 4, ILLINOIS

Harold B. Barry, formerly of Hillsboro, Ill., has been named to succeed Fred Jonah of St. Louis, as chief engineer of the St. Louis and San Francisco Railroad. With the railroad since 1903, he has been assistant chief engineer since 1929. His headquarters will be located in Springfield, Mo.

James O. Hunter, a graduate of the University of Missouri and of Washington University, St. Louis, has been named Missouri state airport engineer. **Leo C. Harman,** formerly a Navy pilot, has been appointed state aviation engineer.

Lewis A. Schmidt, Jr., who has been practicing engineering in Chattanooga, Tenn., for the last year and a half, joined a partnership there under the name of Schmidt, Peerson and Hedman, Engineers. The other members are **John W. Peerson** of Florence, Ala.; and **Aake F. Hedman,** of Knoxville, Tenn. Both have previously been employed by T.V.A., Mr. Peerson more recently as assistant construction engineer at Kentucky Dam, and Mr. Hedman as chief structural designing engineer of the construction plant division at Knoxville.

John Peerson

Mr. Peerson is a civil engineering graduate of the University of Alabama.

Mr. Hedman is a civil engineer graduate of the Royal Polytechnic Institute of Denmark, 1925. After several years as a structural designer with large engineering firms he joined T.V.A. in 1938.

Mr. Hedman and Mr. Peerson were Mr. Schmidt's principal office and field assistants, respectively, when he was construction plant designing engineer for T.V.A. from 1936 to 1941. During this association construction plants aggregating cost of $20,000,000 for Guntersville, Chickamauga, Watts Bar, Hiwassee, Cherokee, and Kentucky dams were designed under their supervision.

Aake Hedman

In the last 18 months Mr. Schmidt's services as a consultant have been used on projects for Kentucky Utilities Co. at Dix Dam, Ky., Central N. Y. Power Co., Syracuse, N. Y., and Missouri Portland Cement Co., at St. Louis. He is also special consultant to T.V.A. at Great Falls Dam and has done foundation ex-

ploration work for Hendersonville, N. C., Harrisburg, Ill.; and the U. S. Army Engineers at Sault Ste. Marie, Mich.

J. A. Fletcher has been appointed county engineer for Peterborough County, Ont. A graduate civil engineer of the University of Toronto, he has recently been acting county engineer for Grey County.

Paul J. Mahoney of Council Bluffs, Iowa, has been appointed county engineer of Pottawattamie County at Council Bluffs, to succeed **Darrell N. Blake,** who resigned to become engineer with the A. N. Eaton Products Co., Omaha, Neb.

J. A. Rowat, Estherville, Iowa, county engineer for Emmett County has resigned to form a partnership at Estherville with **L. W. Murray,** recently discharged from service, to handle drainage work and similar construction. The city council at Estherville has appointed Mr. Rowat as part-time engineer.

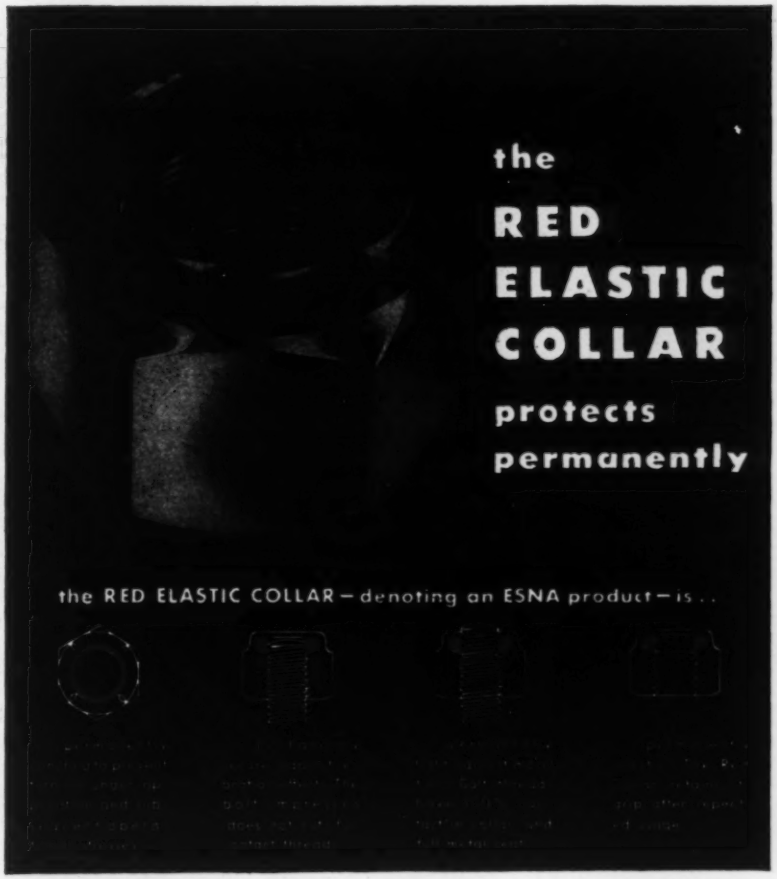
Fred D. McClelland has been appointed Ringgold County engineer at Mt. Ayr, Ia. He formerly served as county engineer for Adama County for eleven years and during the war served the government as engineer in Alaska for one and a half years.

Don W. Robins is the new city engineer of Compton, Calif. A graduate of the university of California at Los Angeles, and specializing in hydraulic engineering, Mr. Robins surveyed work on the Pan-American highway through Central America during 1943 and 1944.

Morales C. Vendig, resident plant engineer for the United Carolina Shipbuilding Co., Wilmington, N. C., has resigned to re-enter private business at Philadelphia, Pa. He went to Wilmington in 1941 as assistant plant engineer, and was promoted to plant engineer.

R. H. Hobner of Defence Industries Limited, has been appointed assistant project engineer at Montreal, Que. He was formerly superintendent of maintenance at Bouchard Works, Jean Brillant, Que.

Col. Richard H. Tatlow, General Staff Corps, Army of the United States, as a member of the staff of the Production Division, Army Service Forces, from October, 1942, to May, 1945, has received the Legion of Merit award because of his eminently successful management of the Army's industrial facilities program. His citation reads: "Colonel Tatlow was directly charged with staff responsibility for all matters pertaining to the processing and approval of industrial facilities, redistribution of facilities excess to the



What happens when this Red Elastic Collar becomes part of a nut? The nut becomes an ESNA Elastic Stop Nut! And it provides permanent protection for any detachable or adjustable assembly.

How?

First, an Elastic Stop Nut *locks in position anywhere on a bolt or stud.* Every bolt can be precisely prestressed to carry its full load. Positioning devices can be adjusted with precision. Vibration cannot disturb these settings – because the Red Elastic Collar eliminates all play between bolt and nut threads with its full contact, permanent grip.

Second, it *prevents thread corrosion.* Moisture is sealed out. Adjustment or removal is easy – any time.

Third, it *prevents thread damage.* Full thread contact in the Red Elastic Collar keeps the metal threads firmly seated. Axial play caused by vibration or stress reversal is dampened.

Fourth, it *prevents seepage of liquids past bolt threads.* Permits nut to be used as a sealing device.

Fifth, it *prevents maintenance waste.* The Red Elastic Collar, which does not injure the bolt or its plating, permits repeated usage.

Here's a challenge: Send us complete details of your toughest bolted trouble spot. We'll supply test nuts – FREE, in experimental quantities. Or, if you want further information write for literature. Elastic Stop Nut Corporation of America, Union, New Jersey. Representatives and Agents in principal cities.

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PRODUCTS OF: **ELASTIC STOP NUT CORPORATION OF AMERICA**

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needs of the using service and for policies and procedures relating to the inspection of material. In fulfilling these duties of an unusually complex nature, he exhibited a high degree of professional engineering and staff ability and marked resourcefulness in devising and implementing new procedures."

Leo W. Peleske is public relations engineer with Consoer, Townsend & Associates, Chicago, Ill. A civil engineer graduate of the University of Wisconsin, he has been city engineer of Superior, Wis., and most recently was sanitary engineer with the Kentucky Water Co., Louisville.

Back to civilian activity

George S. Garman has been appointed county superintendent of highways in Mercer county, Ohio, by State Highway Director Perry T. Ford. He was a staff sergeant in the 192nd Tank Battalion when he was discharged honorably last Nov. 26. He enlisted in the Army in October, 1940, and holds the Purple Heart with one bronze cluster; Silver Star medal, and the Distinguished Unit badge with two bronze clusters.

Thomas R. Jacobi, lieutenant commander, CEC, USNR, has become city engineer of Anderson, Ind. He is an engineering graduate of Purdue University.

Leonard Shaffer, lieutenant colonel, Corps of Engineers, has resumed direction of his construction company in Philadelphia, Pa.

Val A. Mower, major, Corps of Engineers and recently post engineer at Camp Chaffee, Ark., is now in the contracting department of the Iron River, Mich., Lumber and Fuel Co.

Noble A. Bosley, captain, Corps of Engineers, has resumed his former work as a civilian employee of the Seattle District U. S. Army Engineers. He was called to active duty in 1942 while a civilian engineer with the district, and has since served as assistant chief of the construction division, executive officer and chief of the general engineering branch. He is a graduate of Montana State College.

James C. Contratto, captain, Corps of Engineers, has returned to the Department of Roads and Bridges, St. Clair Co., Ill., as engineer of design following services in New Guinea and the Philippines.

Gus Albert, major, Air Corps, a graduate of the University of Wyoming in 1942, has been named assistant state engineer in Wyoming, a post vacant since January, 1945. **L. C. Bishop** is the state engineer.

Demmie H. Cox, colonel, Corps of Engineers, and vice-president and manager of the Houston, Tex., branch of the Texas Gulf Construction Co., Inc., has resumed his duties with the firm after almost five years in the military service, directing military construction in Arizona and in combat in the Southwest Pacific area.

Samuel Jacobs, lieutenant commander, CEC, USNR, has resumed active work as owner of the Adirondack Construction Co., Glens Falls, N. Y.

Eugene Shields has returned to the city water, light, and power department, Springfield, Ill., as engineer.

C. L. Gleason, Ames, Iowa, has been made district engineer for District 1 (Central Iowa) following his return from service with the United States Navy.

Morris N. Lipp, captain, now with the Allied military government in Tokyo, will soon return to his old post as city engineer of Miami Beach, Fla.

Calvin C. Oleson, captain, Corps of Engineers, has returned to his former position as associate professor of civil engineering at South Dakota State College. Prior to his service with the armed forces, Mr. Oleson spent two years as acting head of the civil engineering department at the college.

Sheridan E. Farin, lieutenant colonel, after 5 years service in the Field Artillery, has returned to Division No. 4 of the Public Roads Administration at Chicago, Ill. He took part in the campaign in Germany.

C. S. Monnier of Tremont, Ill., lieutenant colonel, after service in North Africa, Sicily, Italy, France and Germany, has entered the employ of the Public Roads Administration, assigned to the Illinois district.

George A. Keen, formerly in the Army, is now head of the Druid Hill Park division, Baltimore, Md. He is a career engineer in the municipal service.

Sydney L. Ruggles has resumed his former position as construction engineer and maintenance foreman at the Federal Correctional Institution at Danbury, Conn. For more than a year he was engineer of water, sewer and petroleum pipe lines in the construction division of the Alaskan Department, working in the Aleutians.

Morgan Johnson is assistant professor of civil engineering at the University of Maryland. He was recently released from the Navy, when he served in the field test section of the Naval Ordnance laboratory.

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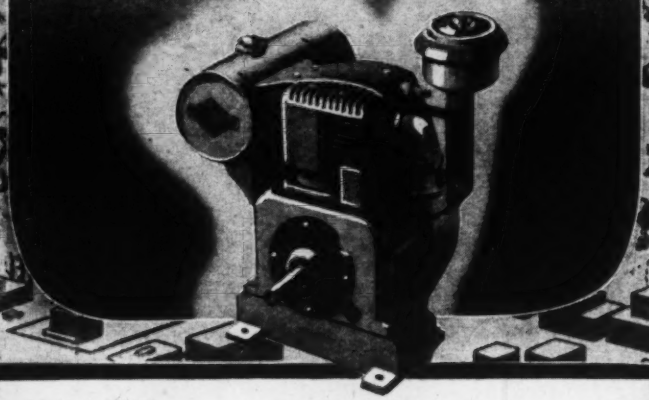
BRIGGS & STRATTON ENGINES

THE "RIGHT" POWER FOR YOUR EQUIPMENT



Manufacturers, dealers and users of gasoline powered appliances, farm machinery and industrial equipment know from experience that it pays to power with Briggs & Stratton 4-cycle, air-cooled engines. Over two and one quarter million of these engines have demonstrated their ability to deliver dependable power under all operating conditions. Specify Briggs & Stratton engines and you are assured of the "right power" for your equipment.

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Air-Cooled Power

4 CYCLE
BRIGGS & STRATTON
GASOLINE ENGINES

Col. George Mayo, C.E., has become district engineer, San Francisco District, U. S. Engineer Department, relieving **Col. Kenneth M. Moore, who has** been **transferred** to the **Duluth, Minn.** district.

Col. Mayo

Colonel **Mayo is a** graduate of the **University of California,** of 1911, and entered the Corps of Engineers in 1916. He had a long period of duty as district engineer at Portland, Ore., and commanded the 1st Regiment of Engineers and Fort Du Pont, Del., from 1928 to 1931. This was followed by service in Hawaii and as chief of the fortifications section, in the Office of the Chief of Engineers, for four years.

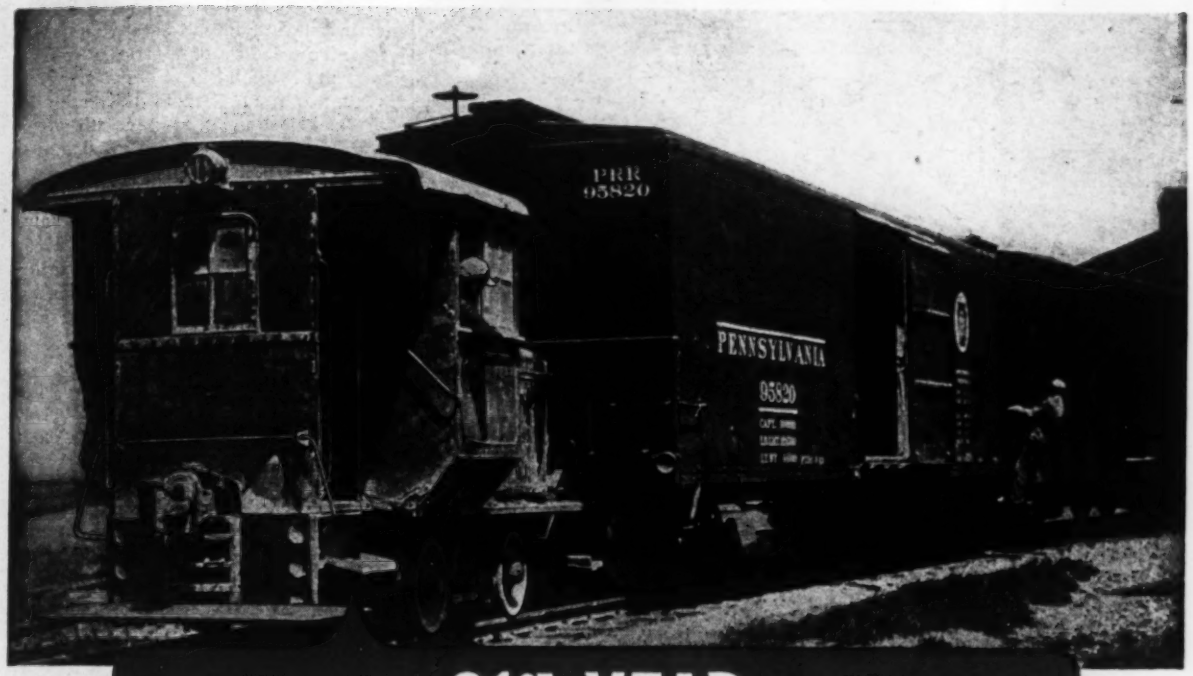
During the war, Colonel Mayo was transferred to the Panama Canal Zone as chief of the Carribean Defense Command and subsequently division engineer of the Panama Engineering Division. In 1943 following duty as commanding officer of the 1st Airborne Unit Aviation Engineering Training Center at Westover Field, Mass., he was appointed chief engineer of the Army Air Forces.

Col. George J. Zimmerman of Cincinnati, Ohio, has assumed new duties as district engineer at Portland, Ore., succeeding **Col. Ralph A. Tudor,** who has left the service. Colonel Zimmerman served in Hawaii with the Engineers in 1931 and in 1934 returned and was assigned as professor of military science and tactics at Washington State College. Later he was assistant district engineer at Seattle, held the same position at Mobile, and then became district engineer at Norfolk, Va. He went overseas in 1944 and took part in the Leyte invasion with the assault echelon.

Col. Zimmerman

Charles A. Jackson, Jr., major, Corps of Engineers, has returned to his pre-war post of civilian engineer with the Seattle District U.S. Army Engineers after receiving his discharge from the Army.

Norman T. Almquist, connected with the American Road Builders' Association from February, 1937 to January, 1942, has been discharged from the Seabees and has returned to the association as administrative assistant.



Starting Its 21ST YEAR on This Job!

When the National Mortar & Supply Co., Gibsonburg, Ohio, purchased this 14-ton, gear drive Plymouth gasoline locomotive back in 1925, it was intended for use in a quarry, handling heavy loads on short hauls. For more than 20 years, it's been doing that job, and has been handling plenty of "extra" work, like car-switching.

This outstanding performance record is the reason why National has added several other Plymouths to its fleet since 1925. And it's the reason why you can look with assurance to Plymouth for the answer to your industrial transportation problem. Plymouth design, materials and craftsmanship combine to provide more tonnage at less cost.

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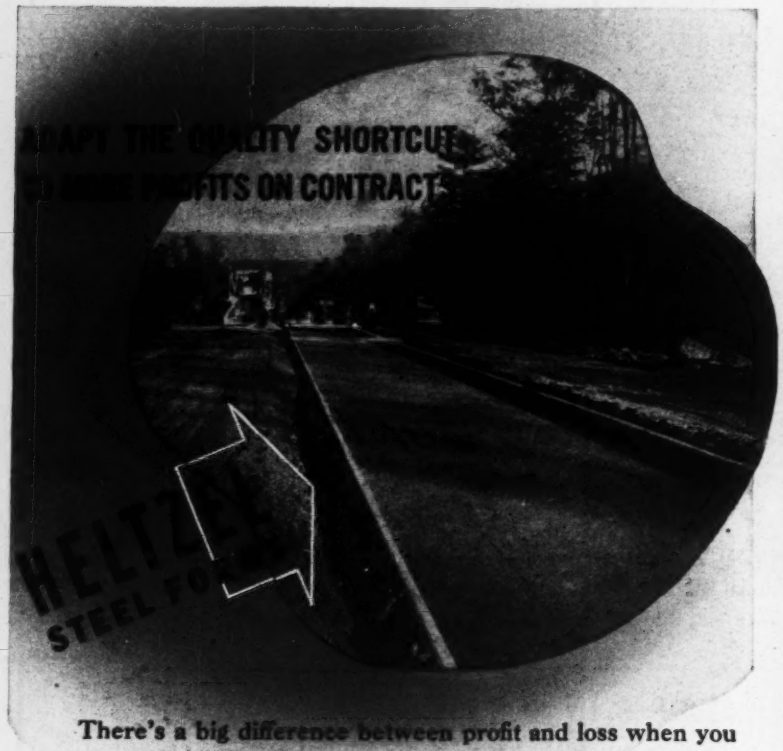

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The value of your Heltzel Forms increases with each additional mile of completed paving. You'll cheer these lower maintenance and conditioning costs.

Vibration or jarring cannot bother Heltzel Forms . . . thanks to a non-clogging, single wedge stake pocket, one of the many exclusive Heltzel features.

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LeRoy M. Davis has joined the engineering staff of Public Utility Engineering and Service Corp. of Chicago, Ill., as assistant hydraulic engineer. He was graduated from Cornell University in 1923 and since then has been with power companies on construction, design, research and operation.

G. C. Thompson, Bourbon County, Kan., road engineer from 1930 to 1936, was recently rehired in the same capacity by the Bourbon county commissioners. He succeeds **Sam Anderson,** who will serve as his assistant.

George A. Mason, for 25 years with the Washington State Highway Department, has been appointed assistant city engineer at Tacoma, Wash.

William J. Weller, civil engineer of Portland, Ore., has been appointed transportation engineer in the public utilities department of that city. He previously had been in the traffic engineering bureau.

Chester McGrane, special layout engineer for the Department of Public Works of Milwaukee, Wis., has resigned, effective April 1, to become construction superintendent for the Badger Construction Co., Milwaukee.

Frank Turner of Raleigh, N. C., an engineer for the Carolina Power and Light Co., has been appointed engineer for the North Carolina State Budget Bureau. He succeeds **W. W. Pollock,** who resigned to join with the engineering firm of Northrup and O'Brien, Winston-Salem.

W. H. Fisher, formerly with the engineering department of Douglas Aircraft Co., has been appointed city engineer at Muskogee, Okla., succeeding **Bruce Patrick,** resigned.

Raymond H. Dodge, who was commissioner of public works at Syracuse, N. Y., until he was succeeded by Charles E. Billion, is in the newly-created post of director of operations.

Capt. G. K. Carnes, a civil engineering graduate of Texas A. & M. College, after a tour of duty with the Corps of Engineers, U. S. Army, in the southwest Pacific, is an instructor of engineering subjects in the advanced section of the engineering department at Fort Belvoir, Va.

At Sacramento, Calif., **A. M. Nash** has been appointed principal highway engineer in charge of surveys and plans. He was formerly district highway engineer at Eureka. Taking his place there will be **George Hellesoe** of the San Francisco district.

—but not Condor Compensated

PATENTED
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with its EQUALIZED PLY STRESSES

In ordinary belt, as it goes around the pulleys, there is a constant alternation of "stretch and buckle" stresses—different for each ply—which speed outer ply rupture, shorten belt and fastener life.

The way the Strength Members are made and applied in the construction of Condor Compensated Belt lets it flex freely and with ***equalized ply stresses.*** This patented and exclusive ***Compensation*** principle represents what is probably the most beneficial development in belt construction of the last quarter century.

Reports like these indicate the kind of service you get from Condor Compensated:

An 8-ply, 16-inch Condor Compensated Belt on a paper mill drive is "still performing like new" after 9 years.

"100% more starting load capacity without appreciable belt slip." . . . Many users report 3 to 4 times longer fastener life from Condor Compensated.

"After the second flood receded, we again dried out the belts. Today they are as good as the day we put them on (2 years) and we have not even had to take them up."

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Condor Belts will be made in the red color when this is again possible.

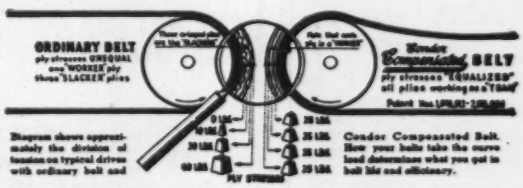
Advantages of Compensation

In all styles of Condor Compensated Belt, you get these belt-saving, production-building advantages:

1. Ruptures in outside ply eliminated
2. Freedom from ply separation
3. Longer fastener life
4. Can be operated over smaller pulleys
5. For heavy loads, plies may be increased with same pulleys
6. Higher overload capacity or margin of safety
7. Less wear on pulley side
8. High production efficiency
9. Material reduction in belting costs

Also available with Style H surface for low tension operation, Style F with friction surface on the pulley side, and Style B with bareback surface on pulley side, where some slip is desirable.

Improve your production now with Condor Compensated Belt. Write for Bulletin.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Condor Compensated BELT
Condor Compensated Belt. How your belts take the curve load determines what you get in belt life and efficiency.

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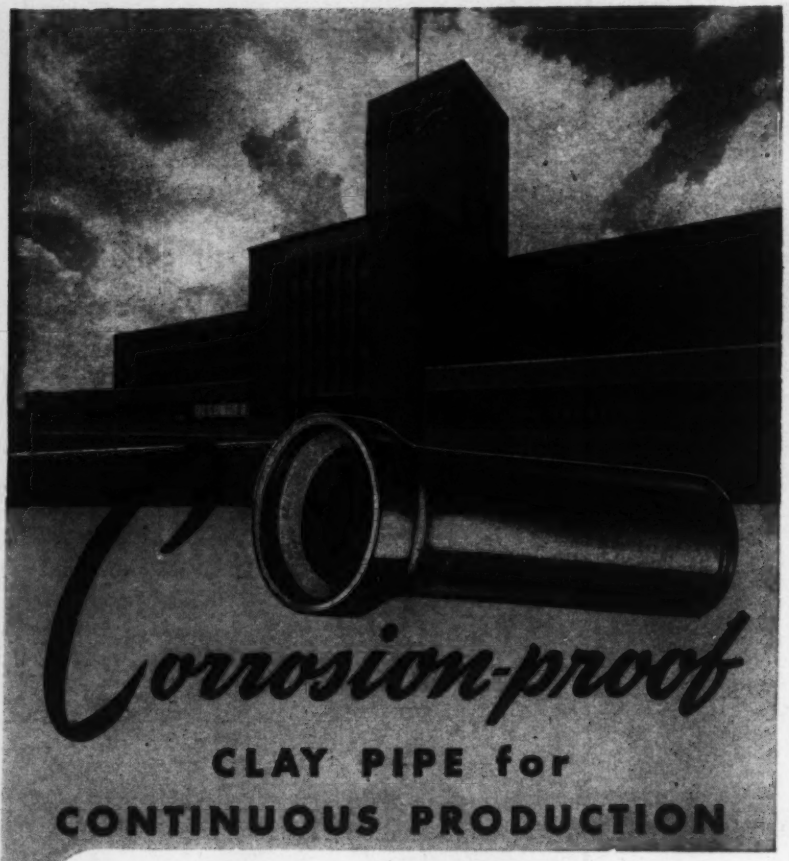

IN nearly every war-producing area, there has been one or more "war casualties" among sewers and drains . . . particularly in industrial plants discharging chemicals and acids into lines not intended to carry this type of waste. The result has been expensive plant shut-downs, costly repairs and replacements.

In no instance has Clay Pipe appeared on any list of systems put "out of action" by corrosion — pipe enemy No. 1. That's because Clay Pipe is completely inert to corrosion . . . its hard, tough texture resists the attacks of acids, chemicals and all kinds of industrial wastes, including hydrogen sulphide from septic sewage and acid soils.

In your reconversion plans, play safe by specifying Clay Pipe . . . the all-purpose pipe for sewers and drains . . . which handles whatever waste comes its way. Once installed, it lasts for generations . . . *it never wears out.* In the long run, Clay Pipe is *the most economical pipe.*

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CLAY PIPE

Elections and Activities

C. E. Parks, Indianapolis, has been elected president of the Indiana Engineering Council. William C. Cupp, Fort Wayne, was named vice-president, and Don E. Pierce, Indianapolis, permanent secretary.

The board of directors of the North Carolina League of Municipalities has elected Davetta L. Steed, Raleigh, executive secretary to succeed Patrick Healy, Jr., who has resigned to look after personal interests in Utah and Wyoming.

Philip Tuttle Williams has been selected executive-secretary of the Carolinas Division of the Associated Contractors of America, Inc., with headquarters in Charlotte, N. C. He succeeds Frank Conner, resigned.

Clarence Zachow, Clintonville, Wis., has been elected president of the Fox Valley chapter of the Wisconsin Society of Professional Engineers. Harry Brevik, Appleton, was named vice-president, Donald Kutchera, Neenah, trustee and Jess Johnson, Sturgeon Bay, was re-elected secretary-treasurer.

Glenn E. Park has been elected president of the Charlotte, N. C., Engineers Club to succeed Beaumert Whitton. Other officers elected are: H. W. Octinger, vice-president; Joe L. Greenlee, secretary and treasurer; and John R. Purser, Jr., J. Marks Abernathy, G. W. Gilchrist and C. O. Fulbright, directors.

A. H. Harding has been appointed manager of the Portland, Ore., chapter of the Associated General contractors of America.

Thomas C. Shedd, professor of civil engineering, University of Illinois, has been elected president of the Central Illinois section of the American Society of Civil Engineers. Vice-president last year, he succeeds H. A. Spofford, Springfield, Ill. Succeeding Mr. Shedd as first vice-president is L. E. Philbrook, Springfield. W. M. Lansford, department of civil engineering, University of Illinois, was named second vice-president, and Dr. Ralph B. Peck, University of Illinois, was re-elected secretary-treasurer.

E. H. Hines, Greenwood, S. C., has been elected president of the Carolinas Road Builders Association, succeeding

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HOUSING Prefabricated Panels, Export Housing.

BRIDGES Prefabricated and Pressure Impregnated.

BARGES Prefabricated and Pressure Impregnated.

TOWERS Tank Towers, Control Towers, Lookout Towers.

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For further information write for Bulletin 2E

INDUSTRIAL PEERLESS PHOTO PRODUCTS

Nello L. Teer, Jr., Durham, N. C. Other officers elected are: John Thompson, Greensboro, N. C., vice-president; and Warren J. Mann, Raleigh, N. C., secretary-treasurer. Named to the board of governors are: C. P. Ballenger, Jr., Greenville, S. C., Sam Dreyfuss, Columbia, S. C., T. P. McKeekin, Cheraw, S. C., Gregory Poole, Raleigh, N. C., K. Sloane, Fayetteville, N. C., and Walter Smith, Charlotte, N. C.

D. D. Gross, chief engineer of the Denver municipal water department, has been elected a director of the American Water Works Association for a 3-year term. Mr. Gross will represent the Rocky Mountain Section of which he is a past president.

James S. Burch, Raleigh, N. C. statistics and planning engineer of the North Caroline Highway Department, has been elected chairman of the planning and statistical committee of the Southeastern Association of State Highway Officials, and W. A. Watkins, also of Raleigh, state construction engineer, has been re-elected chairman of the association's committee on road designs.

These are the newly elected officers of the Producer's Council, Cleveland, Ohio: President, Howard B. Wentz, Armstrong Cork Co.; vice-president, Brighton Slutes, H. H. Robertson Co.; secretary, Harold Bergman, J. S. Zurn Manufacturing Co.; and treasurer, A. C. Gleason of the Crane Co.

R. M. Garth, engineer at the Naval Air Station, Jacksonville, Fla., has been elected president of the Engineering Professions Club. Other officers are W. J. Fowler, vice-president; R. W. Clouss, secretary; W. D. Schultz, treasurer, and N. C. Farmer, program director.

H. H. Johnson, Smith Bros. & Wilson, has been elected president of the Vancouver, B. C., General Contractors Association. Ralph C. Pybus, Commonwealth Construction Co., was elected first vice-president and F. J. Dawson, Dawson Wade & Co. second vice-president. Directors are J. Tucker, Dominion Construction Co.; Hugh Martin, Marwell Construction Co.; W. D. Lee, Vancouver Pile Driving Co.; L. G. Murray, B. C. Bridge & Dredging Company and W. E. Jenkins, Columbia Bitulithic Ltd.

The Seattle Chapter, Associated General Contractors of America, has elected Don Mowat, president of the A. F. Mowat Construction Co., as president. Other officers include O. B. Daniels, vice president; John H. Sellen, secretary, and Elmer Edwards, treasurer. Named to the executive board were J. B. War-

The Aluminum Company of Canada, Ltd., Arvida, Quebec.
Plans by Owners Engineers.
Contractors — Foundation Co. of Canada, Ltd., Montreal.

300,000 Cubic Yards **POZZOLITH** Concrete In WORLD'S LARGEST ALUMINUM PLANT

By using Pozzolith, cement dispersion, the following important benefits were secured:

1. Serious segregation problem, due to hauling mix up to 1½ miles over sprawling job site, was completely overcome.
2. Savings were effected through re-design of mixes.
3. Concrete with greater durability was obtained.

Pozzolith produces all the benefits of air entrainment and does so with increased strength and at lower cost. Findings of the Nation's top testing authority prove this. Pozzolith's high standard of performance has won it wide acceptance, as use in millions of cubic yards of concrete testify.

Would you like to have complete information on Pozzolith?

THE MASTER BUILDERS COMPANY, LTD.

TORONTO In the U. S. A.—The Master Builders Company, Cleveland 3, Ohio **MONTREAL**

MASTER BUILDERS

• MEMO
TO ALL CONSTRUCTION SUPTS.:—
Have we been taking "BUCKETS" too much for granted? What about HAISS high power ratio 7:1
J.J.B.

For Catalogs, Prices, Deliveries Write or Wire

HAISS
HI-POWER BUCKETS
GEORGE HAISS MANUFACTURING CO., INC., 140th ST. & RIDER AVE., NEW YORK 51, N. Y.

MAKE YOUR OWN BLUEPRINTS

WICKES BLUEPRINTER SAVES TIME • SAVES MONEY • NO EXPERIENCE NECESSARY

With a Wickes Blueprinter anyone in your office or plant can turn out sharp, clean prints—quickly and easily. Simplified controls can be mastered in a few minutes. Reproduces prints of any length and up to 42" wide. Speeds range from 3" to 48" per minute. Available in table models, or in floor models with cabinet for storing paper and chemicals. Low operating and maintenance cost. Write for descriptive catalog. WICKES BROTHERS, SAGINAW, MICHIGAN.

rack, George Teufel and J. C. Boe-p flug.

R. E. Chase is the new president of the Tacoma Engineers' Club at Tacoma, Wash. Other officers are F. M. Veatch, of the U. S. Geological Survey, first vice president; J. L. Sharp, Weyerhaeuser Co., second vice president; Carl F. Plugmacher, City Light, secretary-treasurer; and N. W. Temple, Pacific Telephone & Telegraph Co., executive member.

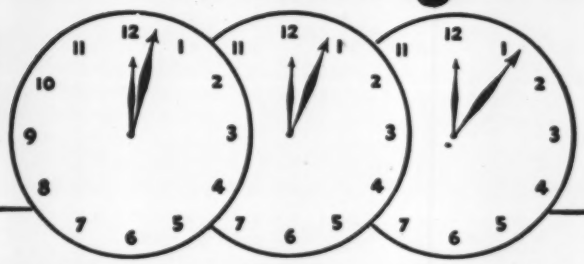
Lars Langloe, consulting engineer of Olympia, Wash., has been elected president of the Pudget Sound Flood Council, while the following were named vice-presidents: C. E. Axelson, Bellingham; C. O. Mannes, Seattle; Lester Corey, Tacoma; Ed. Berg, Olympia; H. R. Dickenson, Hoodsport; Charles Neville, Chehalis; Francis Gleason, Aberdeen, and James Brain, Ellensburg. Named to the executive committee were Charles King, Bellingham; Robin Welts, Mount Vernon; Axel V. Anderson, Sylvania; Charles Wartelle, Seattle; Roy Thompson, Tacoma, F. W. Mathias, Olympia; Lyle O'Dell, Shelton; A. M. Setter, Centralia; John Pearsall, Aberdeen, and S. J. Dumbolton, Ellensburg.

Wariner G. Scott, Lincoln, Neb., state engineer, has been elected president of the Nebraska section of the American Society of Civil Engineers. Other officers are Burgess Manchester, Omaha, senior vice president and Rex Edgemont, assistant professor of civil engineering at the University of Nebraska, junior vice president. E. W. Woodbridge, city engineer at Omaha, is the retiring president. Charles R. Hedke, U. S. district engineer at Omaha, was presented with a life membership for 35 years of service in the society.

Planned to be a permanent Washoe County, Nev., organization, the Reno Engineers Club was recently organized by a group of Reno and Sparks civil engineers. C. G. Hall, regional planning engineer, is president of the organization. Elliott Cann, of the Reno city engineer's office, will be secretary. Other charter members include Charles L. Hill, Kyle Forrest, H. L. Morisette, E. C. Grafton, E. H. Raiford, H. N. Wallace, Fred W. Clayton, H. P. Boardman, A. C. Burhns, A. E. Holgate and William C. Anderson.

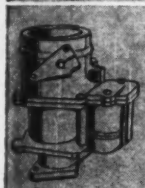
A 5-member Ohio Board of Building Standards has been appointed by Gov. Frank J. Lausche to serve until Dec. 5, 1949, studying and recommending standards of building to be enacted into law. The board comprises W. W. Metcalf, Columbus; Daniel C. McLaughlin, Lima; Granville E. Scott, Norwalk; John P. Jones, Cleveland, and George E. Martin, Cincinnati.

How to Cut Metal Cleaning Time to MINUTES



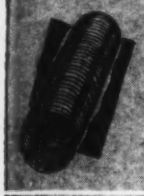
NEW, FAST-ACTION DETERGENT CLEANS FERROUS AND NON-FERROUS METALS... Easy to Handle

TYPICAL USES FOR Solvent "26"



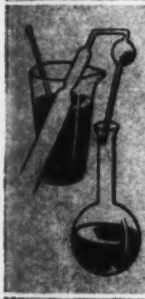
CARBURETORS—Solvent "26" removes gum, gasolene sediment and other accumulations of dirt.

SPARK PLUGS—Solvent "26" safely cleans porcelain, helps loosen carbon deposits.

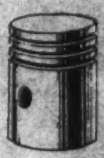


METAL PLATES AND SCREENS—Solvent "26" restores clear, clean finish to any metal surface.

DIES AND STAMPING—Solvent "26" removes drawing compounds from die-formed or stamped metal.



LABORATORY EQUIPMENT—Solvent "26" frees glass and metal tubing and their supports of gums, varnishes and other incrustations or deposits.



PISTONS—Removes lacquers, gums, resins, etc. from gas, gasolene and diesel engine pistons and rings. Also effective for cleaning all parts of dismantled motors, engines and machinery.

REMOVES:

Oil • Grease • Gums • Varnishes • Lacquers • Paints
Carbonaceous Deposits • Asphaltic Products

FROM:

Steel • Cast Iron • Aluminum • Porcelain • China
Chrome and Nickel Plate • Stone • Precious Metals
Brass • Washable Fabrics

Used throughout the war in critical industry as a superior cleaning agent, newly-developed SOLVENT "26" is now available for all industrial needs.

Offering many advantages in time, labor and cost over other present cleaning methods . . . Solvent "26" is so effective a detergent it can be used at *ordinary* room temperatures.

The fast action of Solvent "26" reduces cleaning time from hours to minutes on dismantled engine parts and all kinds of machinery. Simply dip, rub, brush or spray it on. Then flush clean with hot water.

Mail the coupon today for literature and information leading to a demonstration of this unique product in your own plant.

CITIES SERVICE OIL COMPANY
ARKANSAS FUEL OIL COMPANY

CITIES SERVICE OILS
ONCE-ALWAYS

Cities Service Oil Company
Room 619
70 Pine Street
New York 5, N. Y.

Gentlemen: I am interested in a demonstration of Solvent "26"—at no cost or obligation.

Name.....

Title.....

Company.....

Address.....

City.....State.....

The Smith Air Compressor is *right* for the majority of your jobs . . .

- BIG ENOUGH to operate medium weight rock drills, paving breakers, clay spades, tampers, large spray guns . . 60 cu. ft. capacity. Head equipped with high speed compressor valves. Automatic unloading and idling.
- SMALL ENOUGH to be towed at truck speeds from job to job. Initial and operating costs are low. Uses only 1 gal. of gas an hour! Its Ford motor and standard parts mean easy, low-cost maintenance. Don't waste money with oversize, unwieldy compressors. Use the power you pay for.
- Are you interested? Write, phone, or wire today!

GORDON Smith & CO. Incorporated

430 College St. Bowling Green, Ky.

Manufacturers' Activities

C. C. GEROW, first director of sales for Hercules Powder Co. has retired after more than 47 years in the explosives industry. Mr. Gerow was one of the first three men employed by Hercules when the company was formed in October, 1912. He started his career in the explosives industry in 1898, when at the age of 18, he joined the Laflin & Rand Powder Co. as a clerk in the New York office. He became a salesman for the company, and covered the territory around New York City, including parts of Pennsylvania, New Jersey, Connecticut and New York State. Upon joining Hercules Powder Co. Mr. Gerow was appointed assistant to J. T. Skelly, vice-president in charge of sales. Late in 1918, he was made sales manager and for the next ten years supervised all sales, including explosives, naval stores, and cellulose products. When the company was divided into operating departments in 1928, Mr. Gerow became director of sales of the Explosives Department.

His successor, Leroy Keane, was appointed director of explosives sales October 1. Before that, he was manager of the Pittsburgh, Pa., explosives sales office.

APPOINTMENT of Clifford S. Setter as vice-president and chief administrative officer of United States Plywood Corp. has been announced by President Lawrence Ottinger. Mr. Setter has resigned as chief of the Plywood and Veneer Branch of the War Production Board, and also as president of Setter Bros., Inc., of Cattauragus, N. Y., plywood manufacturers.

THE MENGEL CO., Louisville, Ky., has acquired the Foreman-Derrickson Veneer Co., of Elizabeth City, N. C., which operates a hardwood plywood mill with an annual capacity of 20,000,000 ft. The company owns timber to assure a 15 to 20-year operation, according to President A. A. Voit. The plant, completed last April, replaces one destroyed by fire.

W. D. HALEY, Seattle, Wash., has been appointed assistant district manager in the Pacific northwest territory for the shovel and crane division of the Lima Locomotive Works, Inc., Lima, Ohio, according to William C. Champion, district manager. Mr. Haley has been with the company for 15 years.

THE H. A. SMITH MACHINE CO., Hopewell, N. J., has been renamed Rockwell Machine Co. A subsidiary of the Rockwell Manufacturing Co., it supplies precision machined parts to other subsidiaries and divisions of the company. In particular, it builds meter registers, regulators and gage cocks. There are no personnel or policy changes, Herbert S. Rockwell continuing as director of operations at the Hopewell plant.

HERBERT B. MCKEAN, late of the U. S. Forest Products Laboratory, has been engaged by the Timber Engineering Co., Washington, D. C., as assistant to Carl A. Rishell, director of research.

OUTGROWTH of an agreement made in July, 1944, between Henry J. Kaiser and S. A. Perkins, president of Standard Gypsum Co., is an announcement recently made by Kaiser that preliminary work has started on a plant to manufacture wallboard and other gypsum products in Richmond, Calif. Piling is now being driven for plant foundations and deep-water docking facilities, while manufacturing equipment has been ordered to coordinate with a 6-months construction program.

Richmond facilities will include the wallboard plant with a 200,000-sq. ft. per day capacity, a calcining plant, steam plant, raw material storage space, and other buildings. Gypsum lath, hardwall plaster, agricultural gypsum, pebble gypsum, and tile will be produced.

SOULE STEEL CO. announces the appointment of Carl E. Lebeck as district manager for San Francisco and northern California. He will make his headquarters at the main office, 1750 Army Street, San Francisco. Mr. Lebeck is a civil engineering graduate of the University of Minnesota and spent several years in private practice before entering the steel business in 1925. He went from Minneapolis, where he was district manager for Truscon Steel Co. In his new post he will have charge of sales of reinforcing and merchant steel, expanded metal commodities and steel windows and doors.

EDWIN M. PERRIN, advertising manager of Robins Conveyors Inc., Passaic, N. J., since May, 1942, has been promoted to assistant manager of equip-

One Shot Spreading

Fast—Accurate—Low Cost

AIRPORTS

HIGHWAYS

With a Buckeye Material Spreader you can lay an even course of any material from sand to crushed stone in a "single pass." There's no need for raking or brooming. There are no patches to go over; edges to clean up; or low spots to fill.

Width of strips and depth of material are easily controlled. Strip can be spread tapered—thick at one side and thin at the other—or uniformly all the way across. The uniform flow of material is controlled by the spirally fluted feed roll which keeps a positive grip on the material, discharging it evenly in the desired quantities as the truck moves along. Any material—whether wet, dry or sticky—can be spread with absolute uniformity from a trickle to 1½" thicknesses (up to 6" with "Strike-Off" Attachment).

The Buckeye Material Spreader is a complete unit, not just an attachment for a truck. It rolls on its own dual rubber tires (steel wheels optional), and feed roll is transmission driven with adjustments for varying speeds. Users report savings of from 30% to 50% on material; accuracy within 2%; and tremendous savings in time.

Send for the Buckeye Spreader Bulletin today, and learn how you can increase your profits on highway and airport jobs.

BUCKEYE TRACTION DITCHER COMPANY
FINDLAY, OHIO

built by **Buckeye**

CONVERTIBLE SHOVELS—BULLDOZERS—ROAD WIDENERS
TRENCHERS—MATERIAL SPREADERS—R-B FINEGRADERS

HOW TO MAKE YOUR "B" MACHINE LAST LONGER

"I've been around quite a bit. There ain't nothing like a MUELLER "B" Machine for tapping and drilling holes in mains or inserting and taking out corporation stops under pressure. They are so danged popular, I guess at least 95% of the water works must use 'em. They can take a lot of punishment and year round use, but when they are thrown around or handled careless like by green hands they wear out just like any other tool. New ones ain't so easy to get right now so I figure it's smart to take care of our machines. Here are the rules we use. . . Oil thoroughly all parts before using. Put plenty of MUELLER Cutting Grease on drills and fill flutes of taps before using. Don't feed drill too fast. Don't let machine lay around for hours to rust. Right after using, clean out all chips and grease. If you let 'em cake up only the body cleaning chisel will get 'em out. Wipe boring bar clean its entire length and oil thoroughly. Oil feed collar. Keep by-pass open. After machine is clean and washed, wipe all surfaces, especially steel parts, with an oiled rag. Keep every piece in its place in the box—well oiled, and keep box away from moisture."

"B" DRILLING AND TAPPING MACHINE

"BUY BONDS"

MUELLER CO. FOUNDED 1857

DECATUR 70, ILL. LOS ANGELES 23, CALIF.

ment sales. He has spent several years in advertising agencies, specializing in sales promotion and the merchandising of products for industrial clients. At Robins he will work with A. E. Conover, whose equipment sales department is supervised by H. Von Thaden, 1st vice-president. Perrin will prepare sales literature and special bulletins to industries using conveyors and other materials handling machinery.

THE CHICAGO BRIDGE & IRON CO. has opened a sales office in the Healey Building, Atlanta, Ga. H. F. Stearns is in charge.

KLAU-VAN PIETERSON-DUNLAP ASSOCIATES INC., Milwaukee, Wis., advertising agency, has announced the election of George J. Callos, as vice-president and account executive. He was formerly advertising and public relations manager of Allis-Chalmers Manufacturing Co., and at that time was chosen by a national group of advertising men as the outstanding industrial advertising man of 1944.

CHARLES LUKENS HUSTON, first vice-president of Lukens Steel Co. and its ace-veteran employee has rounded out 70 years of service with the concern established by his forebears and in which five generations of his family have participated.

In mid-December 1875, he entered the employ of Lukens Rolling Mill, now Lukens Steel Co., as a clerk at a weekly wage of $8.00. He recalls today that he protested the amount was too much and remembers also that his father who was his employer replied, "never turn down a good offer."

In 1879 Mr. Huston was placed in charge of the puddling mill and in 1882 he took over the management of all plants. He continued in charge of operations until 1925, since then he has acted in a consulting capacity.

A contemporary of Andrew Carnegie, John Fritz, George Verity and Charles Schwab in the early days of the steel industry, Mr. Huston has played an important role in the development of a business which helped turn the tide of war into victory for America and allied nations.

He is the patentee of several inventions used in steel production and is the author of several monographs and books on related subjects. He comes to his office regularly each day and follows closely the various developments in the manufacturing process of the business.

Is your job too tough for your truck?...

No matter how little it cost when new—if your truck is not tough enough for your job *it will cost too much in the end.*

There's only one "bargain" in trucking—and that's *extra work for your money.*

This is why Mack trucks are built the way they are. It's why, for instance, Mack uses Tetrapoid rather than conventional gears—rubber Shock Insulators rather than conventional spring shackles—wrist pins precision-finished to two ten-thousandths of an inch.

When you build a truck this way *it gives its owner extra work.* It stays on the job *longer.* It is in the repair shop *less. It costs less in the end.*

If your trucks give you too much trouble—if repair costs are excessive and service interruptions too frequent—then ask yourself if maybe you're not just using *too little truck for the job!*

If the answer's "*Yes!*"—then you need a Mack. It pays off in work on the job.

MACK MOTOR TRUCK CO.
75 N. Beacon St., Boston, Mass.
Factory branches and dealers in all principal cities for service.

Mack
TRUCKS
FOR EVERY PURPOSE

Performance Counts!

DREDGES
HYDRAULIC·DIPPER
CLAMSHELL

HYDRAULIC DREDGES—8" to 15"
DIPPERS & CLAMS—¾ cu. yd. up

Backed by 40 years of dredge building experience, these units are cutting yardage costs on many different projects—canals, harbors, drainage, sand, gravel, fills, ore recovery and other jobs. Bolted, sectional steel hulls for overland portability and easy relocation.

BARGES & HULLS

CAPACITIES—50 tons up

Prefabricated sections for assembly at site of use with complete erection instructions. Shipment by truck, rail or as hold cargo. Available in many different types for hold or deck cargo, and as hulls for harbor cranes, derrick boats, lighters and similar craft. Outboard motor makes units self-propelled.

STEEL PLATE FABRICATION

Special, difficult weldments for heavy machinery, valves, pressure piping, oil refinery, by-product coke and gas producer equipment. Stress relieving and annealing.

Write for catalogs on any or all ASD products.

AMERICAN STEEL DREDGE CO. INC.
FORT WAYNE 1 · INDIANA · U.S.A.

GEORGE D. SHAEFFER, formerly chief engineer of Gar Wood Industries, Inc., has been elected vice-president in charge of engineering, it has been announced by Glen A. Bassett, president.

Mr. Schaeffer joined Gar Wood in 1938 as chief engineer of its road machinery division, after having served as chief of the road machinery engineering department for Allis-Chalmers Manufacturing Co. for two years. On his graduation from Ohio Northern University in 1921, Mr. Shaeffer served with the Fate Root Heath Co. designing industrial locomotives. He became chief engineer of the road machinery division of W. A. Riddell Co. in 1924, and remained until he joined Allis-Chalmers in 1936.

LINK-BELT Co. has announced that Joseph W. Sears, heretofore district sales engineer at the plant at Dallas, Tex., has been appointed district sales manager at Houston. The appointment of Stuart Penick as district sales engineer at Dallas, to fill the vacancy created by Mr. Sears' transfer to Houston.

Mr. Sears received his engineering education at Armour Institute of Technology, Chicago Technical College, and Austin Evening School, Chicago. He entered the service of Link-Belt in 1935, starting in the engineering department of the Pershing Road plant, Chicago.

Mr. Penick entered the employ of the Link-Belt Ewart plant, Indianapolis, in the engineering department in July, 1935, immediately after receiving his B.S. in mechanical engineering at the University of Texas. He has since gained a wide experience in the application of all types of L-B power transmission and materials handling equipment, having been employed, at various times, at the L-B Ewart plant, Indianapolis; Dodge plant, Indianapolis; Philadelphia plant; Pershing Road plant, Chicago; and at the Dallas and Houston offices.

FOR THE EIGHTH consecutive year, Douglas fir plywood manufacturers have named E. W. Daniels of Hoquiam, Wash., as chairman of their trade association management committee, directing the promotional program of the 30-plant industry.

Daniels, who is president of Harbor Plywood Corp. of Hoquiam, also has been re-elected president of the board of trustees of the Plywood Research Foundation, founded a year and a half ago for development of new products, apart from plywood and lumber, that will utilize waste woods resulting from present logging and processing methods.

Both the research foundation and the trade promotional organization have Tacoma, Wash., headquarters.

Other members of the management committee are: Thomas B. Malarkey, Portland, Ore., vice-president of M & M Wood Working Co.; N. O. Cruver, Tacoma, general manager of The Wheeler, Osgood Co.; Arnold Koutonen, Olympia, Wash., president of Olympia Veneer Co.; H. E. Tenzler, Tacoma, president of Northwest Door Co.; Frost Snyder, Vancouver, Wash., president of Vancouver Plywood & Veneer Co.; B. V. Hancock, Portland, vice president of Cascade Plywood Co.; Robert Seeley, Seattle, Wash., vice-president of Simpson Industries, Inc., and W. E. Difford, Tacoma, managing director of Douglas Fire Plywood Association.

E. L. AIKINS has been appointed district manager of the Allis-Chalmers tractor division office in Seattle, Wash., to represent the company in Alaska, Yukon and British Columbia. Mr. Aikins succeeds S. B. Tatom, recently resigned to become president of Lomen Equipment, Inc., handling Allis-Chalmers tractors and equipment in Alaska. The British Columbia and Yukon territory is served by Rendell Tractor & Equipment Co., Ltd., Vancouver, B. C.

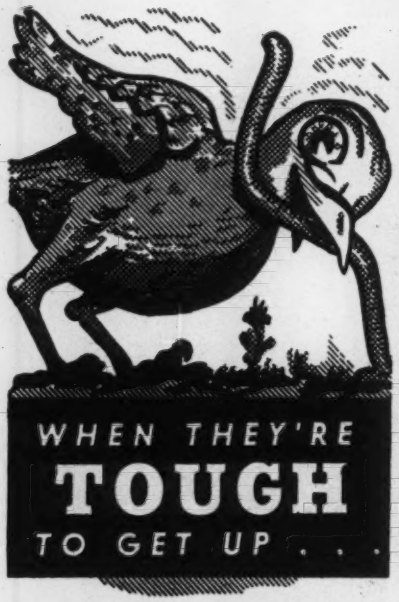
J. P. GRIFFIN, who has been with the Buffalo-Springfield Roller Co., Springfield, Ohio, for more than 30 years, has been appointed western district sales manager. Mr. Griffin will supervise the sales promotion and service instruction of western distributors, contractors, and public officials in Washington, Oregon, California, Idaho, Montana, Nevada, Utah, Arizona, New Mexico, Colorado, and Wyoming.

W. D. HALEY, Seattle, Wash., has been appointed assistant district manager in the Pacific northwest territory for the shovel and crane division of the Lima Locomotive Works, Inc., Lima, Ohio, according to William C. Champion, district manager. Mr. Haley has been with the company for 15 years.

JOHN T. SCHNEIDER, assistant manager of the main plant of Timber Structures, Inc., at Portland, Ore., has been elected vice-president in charge of production. R. B. Fehren joins the executive staff as vice-president in charge of sales, Portland. He formerly managed Timber Structures' eastern fabrication and sales at the Trenton, N. J., plant. Prior to joining the company in 1943, Mr. Fehren spent 14 years with Weyerhaeuser Sales Co. as eastern sales promotion manager and manager of the Weyerhaeuser prefabrication division.

A new sales office, under the direction

AFTER 30 YEARS,
STILL WORKS LIKE NEW
It is the mechanism beyond reach that demands complete confidence. A gate-valve is an underground device; repairs are difficult and time-consuming; delays may cause disastrous loss of life and property. To be worth installing, a gate-valve must be *infallible*.
Take a case in Virginia: It was desired to close a Wood valve after 30 years' inaction; and it closed, true to Wood perfection, easily and *bottle-tight*. It is the design and construction that gives them their reputation all over the world. *Just three internal* parts—stem, spreader, and discs. Fully bronze-mounted; full pipe-capacity flow; no wearing down of parts in contact; no pockets to collect sediment. For working-pressures up to 150 pounds; tested to 300 pounds. Built to conform to AWWA specifications. Size 2″-30″, with bell or flanged ends, or for connection to most standard-type joints. Specify R. D. Wood, the Gate-Valve that serves in watchful waiting.
R. D. WOOD COMPANY
PUBLIC LEDGER BUILDING
INDEPENDENCE SQUARE, PHILADELPHIA 5, PA.
Established in 1803
MANUFACTURERS OF MATHEWS HYDRANTS AND SANDSPUN PIPE (CENTRIFUGALLY CAST IN SAND-MOLDS)



VULCAN
'PILE EXTRACTORS

THE economy and dependability of Vulcan Pile Extractors in getting 'em up and OUT even under the most adverse conditions has been proved on the job since 1927. Three types for all extracting purposes—No. 200 for pulling less difficult piles, No. 400 for pulling small wood piles and commonly used lengths and sizes of steel sheet piles driven under normal conditions, and No. 800 for extracting the heaviest, longest and most difficult steel piles and all size or length of wood, concrete, H-beam or pipe pile.

Cost saving comes through the Vulcan's proved efficiency, ruggedness and fast operation. In many cases the original cost has been repaid on a single job. Get full details on how Vulcan Pile Extractors can help you gain new efficiency and economy. Write today.

VULCAN IRON WORKS
North Bell Avenue
Illinois

of Andy Toth, former district manager for Summerbell Roof Structures, Inc., Los Angeles, has been opened recently in Seattle, Wash., to handle sales in Washington, Idaho, Montana and Alaska.

Timber Structures' business—the fabrication, assembly and erection of roof trusses, bridges, towers, etc.—has been expanded to include the prefabrication of curved roof farm structures, glue-laminating of heavy timber beams and arches, laminated boat keels and ribs, prefabricated housing facilities for offshore shipment, and the manufacture of boxes and crates.

THE STEEL TANK & PIPE CO. of Portland, Ore., has been purchased by the American Pipe & Construction Co. of Los Angeles and will operate as a division of the latter firm. T. L. Hanning, president of Steel Tank & Pipe Co., will remain in an executive position. W. Allen Grubb will be division manager.

CARL A. LUSTER, JR., of Seattle has been appointed Pacific northwest representative for the Lidgerwood Manufacturing Co. of Elizabeth, N. J., and three affiliates: Union Iron Works, Superior Iron Works and Whiting Iron Works.

WILLIAM F. HUGGINS, formerly with the foreign economics division at Washington, has been appointed manager of foreign sales for the LeRoi Co., Milwaukee, Wis.

E. J. O'LEARY, for the last five years district manager at Mobile, Ala., of The Ruberoid Co., manufacturers of asphalt and asbestos building products, has been appointed sales manager for eighteen states in the South and Southwest. Mr. O'Leary will have his headquarters at Baltimore, Md. He has been associated with Ruberoid for fifteen years. Prior to that he had held important positions with Eternit, Inc., manufacturers of asbestos-cement building products.

Building material and hardware dealers throughout the South are served by two large Ruberoid plants—one at Mobile and the other at Baltimore. In addition, various products of a specialized nature are available from Ruberoid factories at St. Louis, Mo., and Joliet, Ill.

THE ACQUISITION of all patent and manufacturing rights of the steel building division of Globe-Wernicke Co. has been announced by Butler Manufacturing Co. of Kansas City, Mo.

Makers of many items for office use, Globe-Wernicke entered the prefabricated steel building field in 1937 and manufactured extensively before material shortages halted this activity in 1942. Due to expansion of their many other divisions and Butler's long-established merchandising set-up in the prefabricated steel building field, Globe-Wernicke decided against a postwar renewal of steel building fabrication.

Experimental buildings are now being fabricated at Butler's Kansas City plant and, after modification and adaptation, fabrication will begin on a mass-production basis. Butler is spending nearly $100,000 in "tooling up" for quantity production, scheduled to begin in 1946.

THOMAS W. BENTON has been appointed manager of the New Orleans sales office of the Tennessee Coal, Iron & Railroad Co. The office will serve Louisiana and south Mississippi. He has been with the company since 1933.

W. G. REYNOLDS, vice-president of Reynolds Metals Co., announced at Louisville, Ky., that the firm is taking over property for a new plant at Sheffield, Ala. The property, located within a few miles of another Reynolds plant at Listerhill, Ala., consists of 11 buildings and 65 acres of land. The property, formerly known as Nitrate Plant No. 1, has been leased for 10 years, with an option to buy from the Tennessee Valley Authority.

Reynolds said the plant would employ from 300 to 500 persons and would be used in the production of building products.

REPUBLIC STEEL CORP., has announced the purchase of the Stevens Metal Products Co., Niles, Ohio, long-established manufacturer of steel barrels, drums and other specialties. Acquisition of the plant gives Republic a direct outlet for use of its steel in the manufacture of these products.

APPOINTMENT of Charles N. Karr as sales promotion manager of the Tractor division is announced by W. A. Roberts, vice-president of Allis-Chalmers Manufacturing Co. Mr. Karr succeeds E. L. Aikins, who was recently placed in charge of the company's tractor division, Seattle, Wash., office. Mr. Karr is a veteran of the Allis-Chalmers tractor division organization. He opened the first Allis-Chalmers tractor branch in Illinois at Bloomington. He moved to Peoria as branch manager in 1931 when Allis-Chalmers purchased the Rumely Co. During the 1930's Mr. Karr spent a few years in the J. I. Case organization, and later was with Cleveland Tractor Co.

THE HOYE & WILLIAMS CO., Shreveport, La., are new distributors for The Buffalo-Springfield Roller Co., Springfield, Ohio, manufacturers of tandem rollers, 3-axle tandem, 3-wheel trench and patching rollers. The territory will include the northern part of Louisiana and eight counties in eastern Texas.

7
REASONS WHY
SOLAR
WELDING FLUX No. 16 GH
IS THE BEST FOR THE WELDING OF STAINLESS STEEL

why SOLAR FLUX was manufactured

For fifteen years Solar Aircraft Company has devoted itself to the design and fabrication of products made of stainless steel and similar alloys. Its principal business is the manufacture of airplane exhaust systems.

To withstand the intense heat of exhaust gases, airplane manifolds must be perfectly welded.

To accomplish these results with minimum time and application effort, the Research Department of Solar developed Solar Stainless Steel Welding Flux No. 16 GH.

This flux was first used and developed exclusively for Solar's own plants. It proved itself so successful that other plants which needed a specialized flux for the welding of stainless steels made arrangements to use it. They, too, have found that for better and speedier welding and fewer rejects SOLAR FLUX No. 16 GH has no equal for the following reasons:

1. EASY TO USE

Solar Flux is easily applied with a brush. It dries quickly because it is mixed with methanol—thus parts can be welded immediately after application.

2. ADHERES BETTER

Solar Flux sticks to the metal because of the use of Methanol and its mineral binder. So tenacious is it that it will adhere to the metal in spite of frequent handling. Parts can be fluxed and stacked days ahead of actual welding, thus facilitating faster production flow.

3. IT GOES FURTHER

Because SOLAR flux can be thinly spread over the weld area—it gives from 15% to 20% greater coverage.

4. NO BINDER—NO "ETCHING"

SOLAR flux requires no shellac or other binders that cause carbon pick-up by the metal being welded.

5. PREVENTS "BURNING" (Oxidation)

SOLAR flux prevents "burning" or oxidation of molten metal during welding because certain inhibitors have purposely been introduced into the flux to prohibit the penetration of oxygen. It prevents pinholes by better elimination of trapped gases.

6. DUCTILE WELDS

Unless welds remain ductile during forming and bending, they will crack or check. Army and Navy certification of welders require that welds must not show failure by checking or cracking when bent through an angle of 180°.

SOLAR research discovered that the presence of too much boron in flux contributes to cracking. In SOLAR FLUX the boron content is carefully controlled, thus ductile welds are uniformly obtained—there are fewer rejects on inspection.

7. NO TOXIC FUMES—WIDER APPLICATION

SOLAR FLUX can be used with oxy-acetylene, atomic hydrogen or metallic arc processes with equal ease and benefit. It gives off no toxic fumes—no special ventilation is needed in the welding room.

Solar Flux Complies with Army Air Force Specification No. 11314
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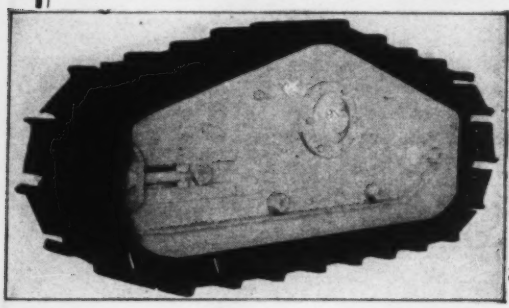

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Manufacturers' Publications

Contractor's Pump Manual—This is designed to supply information on portable pumps and give guidance to pump users in the construction, mining, industrial and other fields. Based on the experience of manufacturers regarding the characteristics of the several types of portable pumps, the manual discusses the selection of the proper kind and size of pump for the particular water-moving job at hand, and the correct operation of the pump, together with its maintenance and repair.

Four types of portable pumps are presented — self-priming centrifugal; diaphragms; well-point; road pumps. In each case the pumps are described and their particular advantages and limitations outlined. A pump selection table is included to serve as a guide in the choice of the kind of pump which can be most advantageously applied to the job to be done.

The booklet may be obtained for 50 cents.—*Construction Foundation, Associated General Contractors of America, Munsey Building, Washington 4, D. C.*

Cooling Water Studies—A 13-page reprint discusses the results obtained in scale prevention in cooling water systems using various chemicals under various conditions. The effect of calcium content, cycles of concentration, temperature, treatment, etc. are evaluated. Numerous photomicrographs illustrate the effect of these variables on the scale crystals formed.—*W. H. & L. D. Betz, Philadelphia 24, Pa.*

Economical Air Conditioning — A new data folder contains an interesting case history of the application of air recovery equipment to an existing system. With facts, figures and installation drawings, it tells how fuel, energy and equipment were saved. Besides the case history, it contains data on ventilation requirements and a typical cost comparison chart showing the savings in money, material and equipment on a new installation. *W. B. Connor Engineering Corp., 114 E. 32 St., New York, N. Y.*

Arc Welding Machine—New alternating current transformer arc welding machines are described fully in a 16-page illustrated booklet. Sections are devoted to small transformer-type alternating current welders, running gear, remote control, and shielded arc electrodes for AC welding. Engineering

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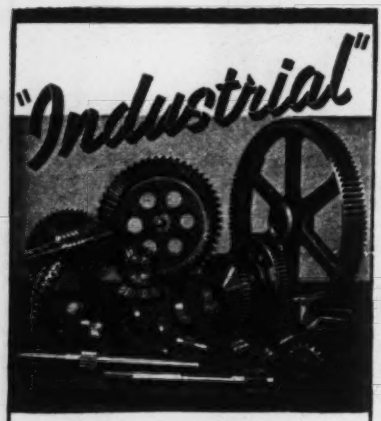

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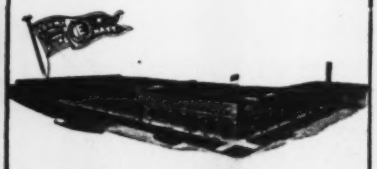

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data and complete specifications are supplied.—*Air Reduction, 60 East 42nd Street, New York 17, N. Y.*

Big-tired Trailer—A 4-page folder describes a flat bed, big-tired trailer and points out how plans for variation in size and style of trailer bed provide different combinations to meet specific requirements of each industry. Also shown is how interchangeability gives a wider scope of usefulness by teaming the prime mover with carryall scrapers, trucks, cranes, and trailers. This manufacturer also issues a wall chart, size 17 x 22 inches, as a quick guide in lubricating equipment.—*R. G. Le Tourneau, Inc., Peoria, Ill.*

Cutting Electrodes—A bulletin on cutting electrodes gives complete details and specifications, together with a fully illustrated description of how to use the electrodes. The bulletin also describes an arc oxygen kit for underwater cutting.—*Ellwood Products Corp., Ellwood City, Pa.*

Pipe Users' Guide—A 56-page catalog features applications of light-weight pipe in diameters from 4 to 30 in. Illustrated are installations showing the application of lockseam spiralweld pipe in the many fields in which light-weight pipe is used. Along with valuable data on pipe structure are sections on precision fabrication and pipe connections, including an entirely new type of coupling.—*Naylor Pipe Co., 1230 East 92nd Street, Chicago 19, Ill.*

Power Hammers—A bulletin gives detailed description of a power hammer's design and construction with its specifications, supplemented by a tabulated list of the advantages and savings claimed for it. Photographic views of the hammer in several positions are shown. Instructions for installation and lubrications are included.—*McKiernan-Terry Corp., Park Row Building, New York 7, N. Y.*

Conveyor Belts—A new guide to the selection of conveyor belts discusses differences in various grades; outlines the qualities in various types of belts and the services for which they are commonly applied. Description and data, as well as the ordinary uses for each grade, together with those for special constructions are also contained in the guide.—*The B. F. Goodrich Co., Akron, Ohio.*

Wet Seal Gas Holders—A 50-page bulletin gives a comprehensive picture of the design and construction of wet seal gas holders. Engineering data on welding technique, pressure, painting surface, corrosion and general dimensions of all sizes of gas holders up to 10,000 Mcu. ft. are discussed. Numerous cross sections are shown, and there are information and tables on the operation and care of wet seal holders. Construction methods are given starting from the laying of the bottom to installing the tank shell, holder sections and guide frame.—*Stacy Brothers Gas Construction Co., 5535 Vine Street, Cincinnati 16, Ohio.*

Sheet Plastic Fabrication—Nine primary operations in the fabrication of sheet plastic articles, and the equipment which may be used, are described and illustrated in a 12-page booklet. Sheeting produced by the continuous extrusion of tenite is a development recently announced. Now this fabricator's guide to the use of the sheeting is published.—*Tennessee Eastman Corp., 10 East 40th Street, New York 16, New York.*

Selecting Arc Welding Electrodes—A 32-page illustrated catalog guides selection of the right electrodes. Electrodes are recommended for use on mild steel, alloy steels, low alloy high tensile steel and stainless steels. Additional sections are devoted to electrodes designed for non-ferrous metals such as aluminum bronze, aluminum and manganese bronze. Chemical analyses, specifications, and other engineering data are supplied for each electrode.—*Wilson Welder & Metals Co., 60 East 42nd St., New York 17, N. Y.*

Concrete Floor Protection—A 4-page folder tells how a patented chemical floor hardener adds years of usefulness to concrete and terrazzo floors by giving protection against concrete dust, acids, salts and alkalies, alternate freezing and thawing and mineral, vegetable and animal oils.—*Building Products Division, L. Sonneborn Sons, Inc., 88 Lexington Avenue, New York 16, N. Y.*

Electrical Indicating Instruments—A 28-page book illustrates and describes hermetically sealed electrical indicating instruments. A section explains the factors involved in the use of instruments and points out the specific indications for certain instruments. The catalogue points out the rigid tests to which the instruments are subjected during manufacture.—*Marion Electrical Instrument Co., Manchester, N. H.*

Tensile Testing—A Bulletin (8 large pages in colors) goes into detail on testing tensile, compression, transverse and shear, for the widest range of materials and all shapes of specimens. A tester enables any concern to do precision physical testing in its own shops. The sturdy unit insures accuracy, with the advantage that it is easily operated even by the untrained. It is calibrated by a Morehouse ring, certified by U. S. Bureau of Standards.—*W. C. Dillon & Co., Inc., 5410 W. Harrison St., Chicago 44, Ill.*